WEST YORKSHIRE COMBINED AUTHORITY
WASTE NEEDS ASSESSMENT CAPACITY GAP ANALYSIS

Final Report September 2017

Report by: 4 Resources Ltd

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Glossary of Terms

AGR Agricultural Waste

C&I Commercial and Industrial Waste

CD&E Construction Demolition and Excavation Waste

DtC Duty to Co-operate

EA Environment Agency

EfW Energy from Waste

GVA Gross Value Added

HAZ Hazardous Waste

HWDI Hazardous Waste Data Interrogator

LACW Local Authority Collected Waste

LLRA Low Level Radioactive Waste

MBT Mechanical Biological Treatment

MRF Materials Recycling Facility

RDF Refuse Derived Fuel

SIC Standard Industrial Classifications

WDI Waste Data Interrogator

WYCA West Yorkshire Combined Authority

WEEE Waste Electronic Electrical Equipment

WPA Waste Planning Authority

Introduction

4Resources were contracted by West Yorkshire Combined Authority (WYCA) in March 2017 to produce a Waste Data Study analysing future waste capacity requirements for their geographical area West Yorkshire (WY) (this includes the waste planning authorities of Bradford, Calderdale, Kirklees, Leeds and Wakefield).

An analysis has been undertaken of all waste arisings within West Yorkshire; Commercial and Industrial Waste (C&I), Local Authority Collected Waste (LACW), Construction, Demolition and Excavation Waste (CD&E), Agricultural Waste, Hazardous Waste (a sub-set of the former categories), Low Level Non-Nuclear Radioactive Waste (LLRAW) and Waste Water and Sewage Sludge. A further analysis has been undertaken to identify all active waste management sites within WY and their capacity (highest throughput tonnages over the last five years) and identify any known future sites that are in the planning process. An additional analysis has also been undertaken to review cross boundary movements of wastes into and out of WY to fully understand current management of waste in the Area.

Following the creation of a bespoke model (with 3 growth options and three behavioural scenarios) that runs with the time period 2017 to 2036, a detailed analysis of capacity gaps for each type of waste management route and future capacity requirements for each waste stream has been undertaken.

Stage 1. Compiling Baseline Waste Arisings for WYCA

This section of the report reviews the robustness and limitations of the available information on current and expected arisings of waste from within the geographical boundary of West Yorkshire (herein referred to as “WY”). The review has been thoroughly carried out for a range of waste streams.

This section provides information relating to the arisings for each of the following waste streams in WYCA:

- Commercial and Industrial;
- Local Authority Collected Waste;
- Hazardous Waste;
- Construction, Demolition and Excavation Waste;
- Agricultural;
- Low Level Non-Nuclear Radioactive Wastes; and
- Water Waste/Sewage Sludge.

This report also provides information on the movement of wastes between WYCA and other waste planning authorities.

1 Commercial and Industrial Waste Arisings

1.1 The Waste Stream

Business generated waste can be defined as either “commercial” or “industrial” (C&I waste) in origin depending upon the sector that generated it. The standard reporting mechanism uses broad business sectors split using 2007 SICs (Standard Industrial Classifications).

Commercial wastes produced by offices, shops, hotels, restaurants and public buildings are very similar to those produced by households, predominantly being plastics, paper and card, glass, food wastes, etc. as well as limited amounts of waste metal (mostly unwanted fittings or electrical equipment).

Industrial premises also produce quantities of these wastes (e.g., from offices attached to manufacturing plants) but also a wider range of wastes from sector-specific activities, such as metal planings, waste oils and paints, wood and cloth off-cuts, etc.

The Local Authority Collected Waste stream includes some waste produced by businesses which is collected under contract by the local authority, and which is referred to as "trade waste". The risk of double counting these wastes is addressed in this report by treating all business-generated arisings as C&I waste regardless of which body collects it.

1.2 Data Sources and methodology

DEFRA have reported the following:

"C&I waste generation is extremely difficult to estimate owing to data limitations and data gaps. As a result, C&I estimates for England have a much higher level of uncertainty than Waste from Households (or other Local Authority Collected Waste). Users should consider this when drawing conclusions from the results and refrain from using them where outcomes are sensitive to exact values. Now that three years have been produced using the same methodology, some conclusions can be drawn from changes between years, however caution should still be exercised. England 2010 and 2012 estimates have been revised substantially from previous publications due to methodological improvements (in the main reducing overall tonnage figures of commercial and industrial waste). UK generation of commercial and industrial (C&I) waste was 27.7 million tonnes in 2014. This has fallen from 32.8 million tonnes in 2012.

Whilst considerable effort has been spent reviewing the methodology for England, this remains a very challenging area. Significant limitations to the available data (e.g. no reporting requirement for operators using waste exemptions) mean there is a high level of uncertainty in the outputs for commercial and industrial waste generation. The recent review has substantially reduced the size of the estimates compared to those previously published (2012 UK estimate revised from 47.5Mt to 32.8Mt), mainly due to the identification and subsequent removal of tonnages that were likely to have been double counted. We continue to work to improve the methodology and assumptions to enhance the accuracy and reliability of these estimates"[1].

The method for calculating Commercial and Industrial (C&I) waste arisings is based on the approach set out in New Methodology to Estimate Waste Generation by the Commercial and Industrial Sector in England (DEFRA, published August 2014) and devised by the consultants Jacobs .

[1] UK Statistics on Waste, DEFRA, December 2016.

A summary of the approach used is provided in **Appendix 1**. This approach uses data on C&I waste arisings from the Environment Agency Waste Data Interrogator (EA WDI) as the basis for calculating C&I waste arisings in the WYCA Plan Area and sets out the proposed approach to assessing levels of C&I waste arisings in the West Yorkshire Sub-region using the method devised by Jacobs in their report of August 2014[2].

The Jacobs report sets out a 5-stepapproach to calculating arisings:

1) Calculate waste arisings sent to permitted facilities;
2) Calculate waste arisings received at incineration facilities;
3) Estimate waste arisings handled at exempt facilities;
4) Calculate waste arisings exported directly from the UK; and
5) Map waste to the sector that generated it and validate.

The method proposed for the West Yorkshire sub-region does not include carrying out step 4, as this is not practically measurable for the sub-region and is not a dataset which would have any significant impact on the arising calculations.

Step 5 involves mapping waste to sector. However, in order to better understand what is happening to waste and to identify future requirements, the proposed approach for the West Yorkshire Sub-region is to map arisings to waste management route rather than the sector.

Therefore, the proposed approach is based on steps 1-3 of the method, as well as step 5 which is tailored to suit the requirements of the West Yorkshire sub-region.

The principle raw data sources for estimating C&I arisings are:

- Environment Agency (EA) Waste data Interrogator (WDI)
- EA Hazardous Waste data Interrogator (WDI)
- EA list of exempt sites
- EA data waste received at Incineration facilities

1.3 Adjustments

The information used to calculate 1) and 2) above in the new methodology to estimate waste generation by the C&I sector will include records for LACW. Therefore, data from wastedataflow which records information on levels of LACW managed by authority is also used. This allows for the total amount of LACW managed in the sub-region to be removed from the total calculations to ensure that the estimates are not incorporating this waste stream.

It is clear that the WDI methodology has severe limitations in tracing C&I waste that is undergoing recycling (often not reported at all , or multiple pickups and point of origin not recorded or direct to specialist reprocessors). In the NW 2009 (extrapolated) C&I survey there was a recycling rate of 66% for WYCA but the WDI yields only 8% recycling Table 1). It was agreed with officers of WYCA and the West Yorkshire Local Planning Officers that this must be very under-reported. For comparison the NW survey gives landfill at 22% for WYCA (Extrapolated to 2015) and the WDI yields 10.6% which it was felt could reflect more accurately the current position as it would be expected for landfill to decrease (due to landfill tax influence and more recycling awareness). The extrapolated NW survey

[2] New Methodology to Estimate Waste Generation by the Commercial and Industrial Sector in England, DEFRA, Project Report, Final, EV0804, August 2014.

provides approximately 50% more tonnages that the WDI (1,064,000 tonnes industrial waste, 1,280,000 tonnes commercial waste). When you look at the individual authority level the WDI yields figures of 127,969 tonnes compared to 538,000 tonnes by the extrapolated NW Survey. It was considered that the answer should be somewhere between the two figures (to reflect the reduction in landfill but to take account of the "missing" recycling). It is also known from reviewing LACW through the WDI that this under records LACW arisings sent for recycling when comparing to actual figures provided through WasteDataFlow.

Table 1 West Yorkshire C&I Waste Arisings Estimates as Extrapolated from the 2009 NW Survey

Treatment Method	Year 2016 with growth (tonnes)	Rounded %
Composting	19,192.97	1
Incineration with Energy Recovery	44,495.37	2
Incineration without Energy Recovery	36,621.54	2
Land recovery	33,815.08	2
Landfill (C+I and Municipal)	491,624.73	22
Recycling (C+I and Municipal)	1,459,468.41	66
Transfer station	40,315.28	2
Treatment plant	60,641.82	3
Waste water treatment	15,340.75	1
Total	**2,201,515.95**	

However when analysing the WDI for LACW it can be seen when comparing against WasteDataFlow that 62% of the LACW arisings that are recycled are not traced in the WDI. This analysis indicates that similar proportions of C&I waste sent for recycling may also be under recorded. This is outlined in Table 2 below.

Table 2 Analysing LACW that is recycled as recorded in WDF but not the WDI (sites with entries within the WDI) for WYCA

Analysis	Result (tonnes)	%
LACW Recycled but recorded in the WDI as managed as treatment facilities	61,479	25
LACW Recyclate correctly recorded at recycling facilities	30,172	13
LACW recycled at permitted facilities but not recorded by the site in WDI data	34,325	14
LACW recycled but NO record at permitted sites in WDI	117,581	48
Total	**243,557**	

Recycling data was initially taken from WDI records for the fate of waste removed from permitted waste management facilities. It is likely that this may be an underestimate of recycling as materials can be recycled through exempt facilities for which no records are made whilst specialised recycling and reprocessor facilities may be widely distributed and origins are often not recorded. It can be seen that just as LACW that is recycled is under recorded in the WDI then so too is C&I.

In the WDI without any adjustment for the "missing" recycling not recorded in the WDI (after detailed analysis using permit and facility type in the WDI) the following C&I waste materials were recorded for WYCA.

Table 3 C&I waste arisings from analysis of 2015 WDI (at lowest level permit and facility type)

	Landfill	Metal Recycling	Treatment	Recycling	EfW	Totals
Bradford City	14,061	79,549	87,548	41,658	253	205,726
Calderdale	22,935	43,042	46,601	8,518	152	121,248
Kirklees	16,004	45,483	116,825	23,320	26	201,658
Leeds	136,530	79,300	186,956	90,058	940	493,784
Wakefield	94,384	31,536	152,807	58,808	1,437	338,972
Totals	**283,914**	**278,910**	**590,738**	**205,019**	**2,808**	**1,361,388**

In accordance with the DEFRA methodology, waste passing through a waste transfer station was removed from the estimate in order not to double count such arisings, which would be eventually managed at other treatment or disposal facilities.

Hazardous waste arisings are also removed from the total arisings figure as these are recorded within the EA's hazardous Waste Data Interrogator (HWDI) and these are dealt with in the Hazardous Waste Section of this report. However, we have included all waste recorded as "hazardous" in the WDI database in the initial data and then subtracted the quantities of waste shown in the HWDI as it appears that some wastes are recorded as hazardous in the WDI but do not show as hazardous under the more rigorous HWDI definitions. Table 3 also includes any C&I wastes recorded as origin as Yorkshire and Humberside (as on deeper analysis it can be seen that the majority of this material is in fact West Yorkshire). The figures also include any municipal (ECW codes 20 and 19 for secondary) but obviously not LACW.

The next stage in the analysis is to adjust to take account of the "missing recycling" not recorded in the WDI (in the same principle as was noted for LACW).

Table 4 Adjusting the WDI results to take account of the missing recycling not recorded in the WDI (on the same principle for LACW) for WYCA

Analysis	Tonnage	%
Recycling recorded in the WDI	205,019	Equals 13% of totals arisings for recycling if equivalent to LACW performance).
Recycled but recorded in the WDI as managed at Treatment facilities	394,266.84	25
Recyclate correctly recorded at recycling facilities	205,018.76	13
Arisings recycled but not traced in the WDI DATA	977,781.77	62
Total	**1,577,067.38**	

Information for waste managed by incineration is limited to data on the fate of waste removed from permitted waste management facilities. There is no systematic recording to the origin of materials sent directly from producers to incineration of energy recovery facilities not covered by the waste permitting records system. Within West Yorkshire most of the active Energy from Waste sites only process LACW at present under long term contracts although there are three potential plants (permitted but not built or operational within West Yorkshire) that could process C&I waste materials.

1.4 Baseline Waste Arisings

Following the adjustments recorded under section 1.3 the adjusted baseline for C&I is shown in Table 5. A total of 2,472,580 tonnes of commercial and industrial waste is recorded for 2015 in WYCA.

Table 5 Total C&I arisings by waste management route (tonnes) (following adjustments)

Authority	Landfill	MRS	Treatment *	Composting/ Recycling	EfW	Totals (tonnes)
Bradford City	14,061	79,549	40,790	320,446	253	**455,099**
Calderdale	22,935	43,042	30,221	65,520	152	**161,871**
Kirklees	16,004	45,483	71,978	179,387	26	**312,878**
Leeds	136,530	79,300	13,767	692,758	940	**923,294**
Wakefield	94,384	31,536	39,715	452,367	1,437	**619,439**
WYCA	**283,914**	**278,910**	**196,471**	**1,710,478**	**2,808**	**2,472,580**

* Treatment is adjusted down to take account of the records shown as treatment but on more detailed analysis is in fact recycling.

On analysis the consultants and local authority representatives were concerned that this methodology approach appeared to work for all the authorities except Leeds as this appeared to be too low and therefore further analysis has been made to understand if there are specific reasons why this should be so.

In the other 4 West Yorkshire authorities the methodology used to estimate recycled waste not captured in the WDI database shows that of waste recorded as managed through treatment facilities in WDI records an average of **55%** of treated waste is assigned to recycling.

Analysis based on waste removed from treatment facilities can be used to indicate what proportion of waste managed through treatment facilities is recycled. For the other 4 West Yorkshire Authorities this shows that some **60%** was removed for recycling and is reasonably consistent with the results from the methodology used to reflect recycled waste not captured in the WDI database using deposit records (It should be noted that the records of waste deposited and removed rarely match in any one year).

However , looking at the same dataset for Leeds this shows that of waste recorded as managed through treatment facilities in WDI records an average of **93%** of treated waste is assigned to recycling, whilst the WDI recycling data records were already relatively higher than the remaining 4 authorities.

Analysis based on waste removed from treatment facilities in Leeds shows that some **54**% was removed for recycling.

It can be concluded that whist the methodology used to correct for recycled waste not captured in the WDI database is realistic for the 4 other authorities but the result for Leeds is an anomaly. It is therefore recommended that a further adjustment is made for the estimate of treatment capacity of C&I waste for Leeds by applying a factor of **55%** recycled to the waste recorded at treatment facilities in Leeds (which is consistent with the observed data from the other 4 authorities). This would result in the estimate for C&I arisings requirement treatment at a figure of 84,130 tonnes (i.e. 45% of the WDI unadjusted total of 186,956 tonnes). This switch from the lower estimated treatment total would also result in a lowering of the total estimated recycling for Leeds to 589,932 tonnes.

The data in the baseline for treatment and recycling C&I will therefore be as in the table below.

Table 6 C&I Baseline Arisings for WYCA, 2015 (tonnes)

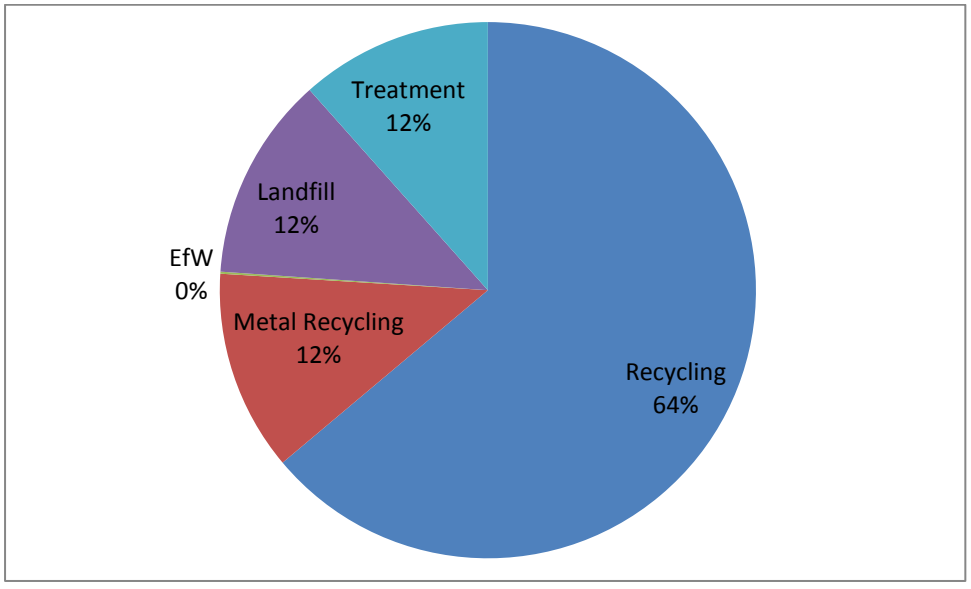
Adjusted to reflect Unrecorded Recycling	Treatment	Recycling
Bradford City	40,790	320,446
Calderdale	30,221	65,520
Kirklees	71,978	179,387
Leeds	84,130	622,359
Wakefield	39,715	452,367
WYCA	**266,834**	**1,640,115**

Table 7 Final Adjusted Estimate for C&I for WYCA, 2015

Authority	Landfill	MRS	Treatment *	Composting/ Recycling	EfW	Totals (tonnes)
Bradford City	14,061	79,549	40,790	320,446	253	**455,099**
Calderdale	22,935	43,042	30,221	65,520	152	**161,871**
Kirklees	16,004	45,483	71,978	179,387	26	**312,878**
Leeds	136,530	79,300	84,130	589,932	940	**923,294**
Wakefield	94,384	31,536	39,715	452,367	1,437	**619,439**
WYCA	283,914	278,910	266,834	1,607,652	2,808	**2,472,580**

* Treatment is adjusted down to take account of the records shown as treatment but on more detailed analysis is in fact recycling.

Figure 1 C&I Waste Arisings by management route



Recycling activity is variable across the combined authority but composting is very low with only some 144 tonnes can be identifiable as C&I origin.

1.5 Exempt Arisings Estimate

Whilst the Environment Agency holds records on exempt facilities there are no detailed records to say how much waste has been received at the site as input records are not required. The DEFRA

report therefore, recommends using an estimate of 19% of the total arisings as being managed through exempt facilities. Using the DEFRA methodology to estimate waste arisings that could be produced from exempt facilities in the combined authority area this gives a figure of 444,442 tonnes. It may be concluded that exempt facilities will form a significant element of recycling facilities for which there are no records of waste type, quantities of origins. However, these exemptions have been taken into account in the recycling adjustments made in section 2.1 above.

Table 8 Breakdown of tonnages of C&I generated from exempt facilities in WYCA

Authority	Exempt facilities Estimate Tonnes
Bradford City	61,121
Calderdale	30,755
Kirklees	59,447
Leeds	175,426
Wakefield	117,693
WYCA	**444,442**

Information for specific exempt facilities is inadequate to be included on modelling projections. Thus, whilst an estimate of waste managed through exempt facilities is included in reported totals, waste estimates cannot be included in the modelled data other than in the adjustment made in section 1.4.

2 Construction Demolition and Excavation Arisings

2.1 The Waste Stream

Construction, Demolition and Excavation waste (CD&E) is waste generated as a result of building and engineering activities, maintenance works, demolition of existing buildings/structures and excavation activities (tunnelling, drain laying, excavation works relating to the laying of foundations etc.).

Excavation wastes are largely soil and stones, though some artificial materials (concrete, slag, etc.) may be generated where work occurs on previously developed, Brownfield or derelict land. Some of these arisings are classified as hazardous wastes because they have been contaminated with oils, dusts or other material as a result of previous uses of the site.

Construction wastes comprise a range of materials, with substantial quantities of brick or concrete rubble, internal fittings of metal, plastics, glass, etc., as well as materials from shallow excavation (e.g. shale rubble from the removal of hard-standing areas). These wastes may also include insulation materials, including those containing gypsum and asbestos, both of which are classified as hazardous waste.

2.2 Data Sources

An estimate of how much CD&E waste is produced in WYCA can be made with respect to how much material passes through permitted sites. Data has been published in the Environment Agency Waste Data Interrogator (WDI) for 2015. This gives quantities of CD&E waste deposited at sites which are subject to Environment Agency permitting.

The amount of CD&E waste generated is related to how much development (buildings/ infrastructure) and regeneration activity is taking place in the WYCA. As this is the case, it must be recognised that CD&E arisings have the potential to vary significantly year to year and the figures quoted in this data study (covering 2015) will be representative of the amount of development activity taking place in the year in which it was gathered.

2.3 Caveats and Limitations

The source data referred to above provides some information on origin and waste movements but it does not provide a complete estimate as:

- There are inconsistencies in the thoroughness with which CD&E wastes are reported in terms of the materials that are generated;
- Environment Agency reporting is only required if material leaves the site where it originates. Therefore any wastes recycled or re-used on site are not counted.

Both of these issues are recognised drawbacks of the lack of consistent reporting of CD&E arisings and affect all waste planning authorities. They also reflect the legislative provisions that dictate which wastes have to be reported and there is no viable way of compensating for them.

Furthermore, there is no tonnage data available covering “Registered Exemptions” for CD&E. Exemptions permit burning or spreading waste on land for reclamation/improvement, sites used for the storage of CD&E materials and crushing and screening of materials used for recycling on site or for other exempt construction uses and do not require waste contractors to report how much waste was handled or what happened to it. Some of the wastes created may be managed on the site where the waste arose, but this is not always the case. However exemptions normally apply where relatively small quantities of waste are being managed, or on a one-off basis. As a result the quantity of waste managed under exemptions varies from one year to the next and cannot be predicted or monitored directly.

Although apparently problematic, these limitations can be addressed as follows:

- On-site recycling: waste plans aim to deliver land to meet forecast management needs which occurs away from where wastes arose, and therefore wastes recycled at source make no demand of off-site capacity.
- Exemptions: the situation is very similar. Exempt activities often occur on a one-off basis and on a relatively small scale. This report takes the position that if the proportion of CD&E waste managed through permitted sites and exempt facilities remains constant then the forecast of how much CD&E waste is managed at permitted facilities identified from the WDI represents the best available estimate of current and future capacity for managing CD&E wastes. Moreover, there is no tonnage data available covering “Registered Exemptions” for CD&E and it is assumed that such activities, such as sites used for the storage of CD&E materials and recycling of C&D on site will be taking place in the WYCA. Therefore the CD&E arisings given in this report must be assumed as minimum arisings figures or taken as indicating the quantity of waste that has to be managed at locations distant from where it arose.

The management of CD&E waste within the whole West Yorkshire sub-region is analysed on the basis of waste deposited as recorded in the Environment Agency's Waste Data Interrogator (WDI). This will essentially capture most CD&E waste deposits in the sub-region and thus be representative of arisings. The impact of double counting is taken into account as waste is often moved to more

than one site through waste transfer. An apportionment of CD&E arisings is made based on proportion by population to reveal tonnages at the individual authorities within WYCA.

Previous estimates have been based on a Survey of Arisings and Use of Alternatives to Primary Aggregates in England, 2005 undertaken for the DCLG. The outputs from this survey were based on firstly the estimated number of recycling crushers in a regional level only (Yorkshire and Humberside) and the estimated throughput of these recycling crushers (the survey had a 21% response rate). The use of mobile crushers at demolition sites means that a significant proportion of CD&E materials managed through this process will not show in EA Interrogator records. In statistical terms the low response rate makes grossing up problematic. It is also possible that responses were obtained from the most active plant operators. The 2005 survey take no account of CD&E management through transfer facilities or treatment plant other than recycling crushers.

The other data source was from a survey of landfill operators where landfills were grouped into 4 landfill categories. The data from the 39% of operators who responded were averaged out and grossed up to reflect tonnage disposed of at the total number of landfills in each category in each region. The Yorkshire and Humberside (population 5.3 million) recorded 188 landfills compared with the NW region's total of 98 (population 6.9 million). This methodology would therefore tend to inflate CD&E landfilling in the Yorkshire and Humberside region such that the estimated figure landfilled in this survey was 3,906,482 tonnes whereas the NW region was estimated at only 2,666,260. The EA WDI showed a total of CD&E waste disposed of to landfill as 2,065,584 tonnes about half that suggested by the 2005 survey(2011 data). This analysis indicates that the 2005 survey is both out dated and should not be relied on to provide an adequately robust indication of CD&E arisings.

2.4 Baseline Waste Arisings

The EA Interrogator 2015 shows a total of 2,051,695 tonnes of CD&E deposited at permitted waste management sites and originating in the WYCA consisting of 571,145 tonnes of C&D waste and 1,480,248 tonnes of excavation waste.

Waste recorded at transfer facilities is excluded from these totals to avoid double counting, as waste is ultimately deposited at permitted sites. Deposits at sites within the West Yorkshire sub region were included as were exports to the wider region of Yorkshire and Humberside and neighbouring regions. This analysis showed that most CD&E waste is managed within the West Yorkshire sub region whilst "exports" were only significant to adjacent authorities within the Yorkshire and Humberside region. Exported CD&E waste accounted for less than 10% of estimated arisings and 92% of these exports remained within the Yorkshire and Humberside region.

Whilst over 90% of CD&E waste is managed within the sub region there is a significant transfer of this waste between the individual West Yorkshire Authorities due to the location of landfill and processing plant within different authorities. The proportion of CD&E waste managed by individual authorities has therefore been allocated by population as the most significant factor in determining these arisings. GVA was considered as a factor, however, the GVA per head of population for Leeds is likely to be influenced by specific economic factors that may not relate to wider construction activity and population was considered the more appropriate factor. Findings are shown in Table 9.

Table 9 The estimated CD&E arisings for WYCA showing individual authority proportion (based upon population numbers) by management route (tonnes)

Authority	C&D Landfill	C&D Recycling	Excavation Landfill	Excavation Recycling

Authority	C&D Landfill	C&D Recycling	Excavation Landfill	Excavation Recycling
Bradford City	**26,162**	**106,868**	**287,669**	**56,928**
Calderdale	10,265	41,929	112,864	22,335
Kirklees	21,392	87,382	235,215	46,548
Leeds	38,125	155,735	419,207	82,958
Wakefield	16,439	67,150	180,754	35,770
Totals	**112,384**	**459,063**	**1,235,709**	**244,539**
WYCA	**Total C&D Arisings 571,447**		**Total E Arisings 1,480,248**	

Figure 2 C&D arisings for WYCA by management route, 2015

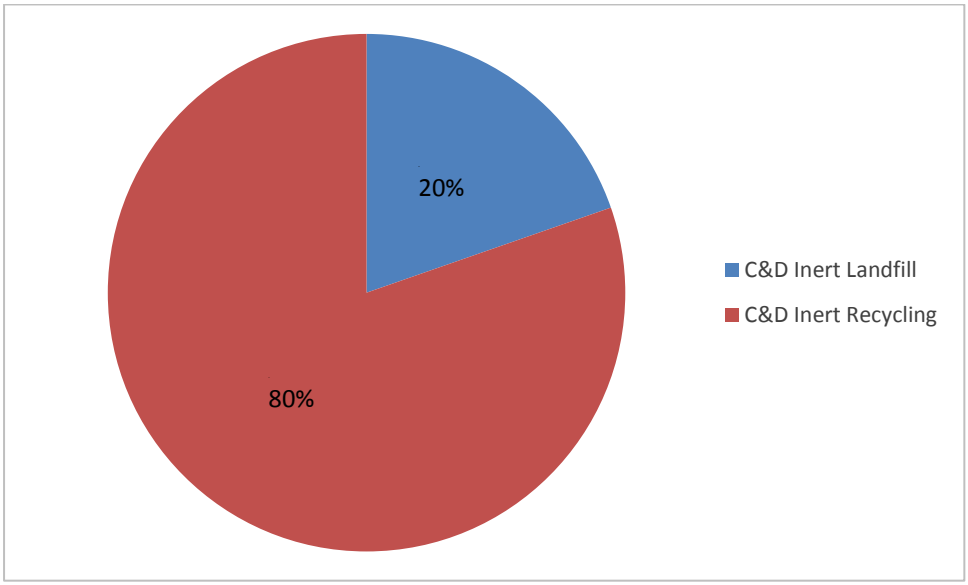
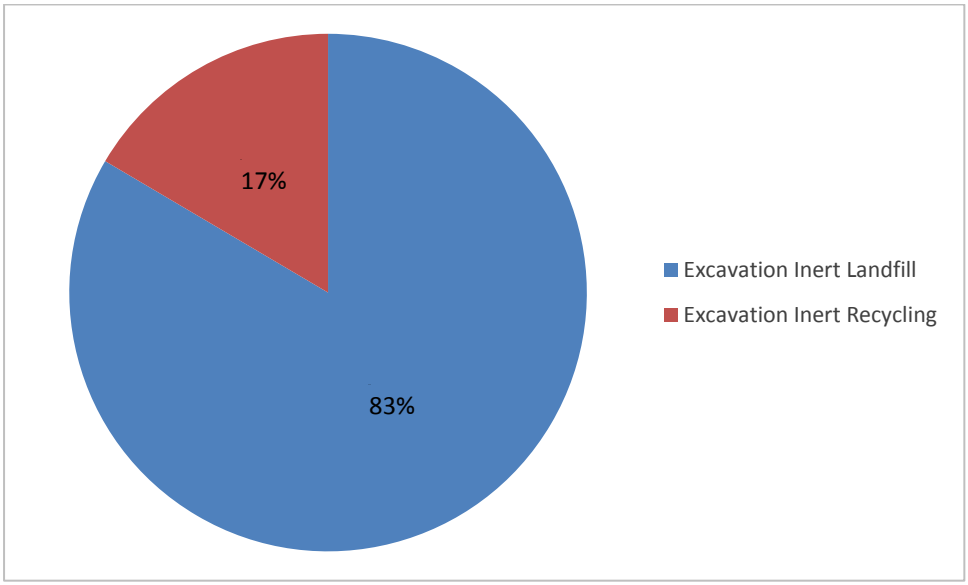


Figure 3 Excavation arisings for WYCA by management route, 2015



3 Local Authority Collected Waste

3.1 The Waste Stream

The following LACW wastes have been distinguished; household waste, non-household waste and secondary waste so that they can be modelled separately in the model to allow for behavioural targets (covering recycling and a move away from landfill) can be applied to the correct materials in line with UK guidelines and targets.

Previously the term 'Municipal Waste' (MW) was used in UK waste policies and nationally reported data to refer to waste collected by local authorities. In 2010, negotiations with the European Commission and consultation with the waste community redefined terms and waste management performance targets in order to ensure the UK complied with the EU Waste Framework and Landfill Directives and that calculation of landfill rates was based on an appropriate range of material and not just that collected from households and from the public realm.

As a result the term MW was superseded in 2011 by Local Authority Collected Waste (LACW) which still refers to all of the waste collected by a local authority irrespective of the type of premises that generates the material. It includes waste from domestic properties and that from non-household sources such as road sweepings and litter collected from public highways. LACW also includes wastes generated by smaller businesses, institutions such as schools, prisons, camp sites, gypsy and traveller sites, hospitals and nursing homes.

The Controlled Waste Regulations (1992) set out the types of waste to be treated as household, industrial and commercial waste. Regulation 43, commonly known as Schedule 21, sets out under paragraph 4 those types of household waste for which a local authority may make a charge for collection and such wastes have been excluded from LACW figures (including trade waste from businesses and schools). The LACW stream comprises wastes originating from three sources as described below and further references in the report will distinguish between them as appropriate:

- LACW (H) comprises all wastes collected directly from households and that collected from the household waste recycling centres (HWRCs). It excludes rubble, soil, plasterboard left at these sites which are counted as part of the CD&E stream (see Section 2 of this report). This material matches the 'waste from households' component of LACW which is used in the UK to assess recycling and composting performance for these materials against EU and national targets;
- LACW(Non Household) which comprises all wastes collected from non-household sources such as that collected from road cleaning (sweepings and gullies), plasterboard, soil/rubble collected at HWRCs and green waste collected from public parks);
- LACW(secondary) which comprises products by secondary processing so treatment outputs after initial materials recycling facilitation so EfW, MBT and by-products from such process such as energy recovery of household and non-household wastes and comprises metals, bottom ash and Air Pollution Control Residues (APCRs).

3.2 Data Sources

Detailed waste arisings have been extracted from WasteDataFlow publicly available information covering 2015/16.

Hazardous waste has been excluded from LACW to avoid double counting as these wastes will be included in the data on Hazardous Waste from the Environment Agency's HWDI. Rubble /CDE will be included in CDE and not in LACW. An effort has also been made to separate out commercial waste

where possible (trade waste collections will be covered under C&I) however once passing into secondary processing it cannot be traced and will need to be modelled combined.

3.3 Baseline Waste Arisings

The assessment reveals the total tonnage for WYCA as shown in Table 10 below;

Table 10 LACW waste arisings by Management (October 2015-September 2016) (tonnes) taken from WasteDataFlow and verified by the individual councils

	Bradford	Calderdale	Kirklees	Leeds	Wakefield	WYCA
Household						
Composting	24,418	8,569	13,588	43,242	23,845	113,662
Recycling	28,215	23,464	29,755	74,136	40,225	195,795
Residual MRF	150,214	52,649		167,130		369,993
Non-Hazardous Landfill			15,236	28,987	28,065	72,288
EfW			102,395		21,456	123,851
MBT					41,370	41,370
Sub-total Household	**202,847**	**84,682**	**160,975**	**313,495**	**154,961**	**916,960**
Non-Household						
Composting	870		168	560		1,598
Commercial Recycling	980		1,182	1,759	645	4,566
Commercial Residual MRF	19,218		23,581	2,541	11,598	56,938
**Rubble/CDE Recycling	6,993	4,662	10,899	13,785	8,119	44,458
Other Non-Household Residual MRF	1,686		737	5,004	1,502	8,929
*Haz Asbestos (Haz)	30	19	158		49	256
*Healthcare (Treatment/Haz Landfill)	19	153	174	26	360	732
Sub-total Non-Household	**29,796**	**4,834**	**36,899**	**23,675**	**22,273**	**117,477**
Secondary						
EfW	95,708	33,943		163,090	1,200	293,941
Recycled (Incinerator bottom ash)			30,249		5,409	35,658
Recycled (dry recyclate)	22,676	8,865	4,240	6,701	2,260	44,742
Recycled (compost like material)	14,932		6,348			21,280
Non-Hazardous Landfill	37,803	8,714	19,089	48,775	964	115,345
*Hazardous Landfill (fly ash)			412	188	18	618
RDF, Autoclave, MHT or Similar			2,388	312	179	2,879
**Inert Landfill				795		795
Composting(In-Vessel/windrow)					4,369	4,369

	Bradford	Calderdale	Kirklees	Leeds	Wakefield	WYCA
Sub-total secondary	**171,119**	**51,522**	**62,726**	**219,861**	**14,399**	**519,627**
Total LACW	403,762	141,038	260,600	557,031	191,633	1,554,064

In the subsequent modelling process hazardous waste will be excluded from LACW to avoid double counting as these waste will be included in the data on hazardous waste (from the EA HWDI), rubble/CDE will be included in the CDE and not in LACW. Also commercial waste has been separated out where possible (trade waste collections are covered under the C&I modelling however once passing into secondary processing it cannot be traced and will need to be modelled combined.

Table 11 Summary Total LACW Waste Arisings (October 2015 - September 2016)

	Bradford	Calderdale	Kirklees	Leeds	Wakefield	WYCA
Household	202,847	84,682	**160,975**	313,495	154,961	916,960
Non-Household	29,796	4,834	36,899	23,675	22,273	117,477
Secondary	171,119	51,522	62,726	219,861	14,399	519,627
Total	**403,762**	**141,038**	**260,600**	**557,031**	**191,633**	**1,554,064**

4 Hazardous Waste

4.1 The waste stream

Hazardous waste is a sub-category of C&I, LACW, CD&E and Agricultural wastes, but can be distinguished through the records of the Environment Agency's Hazardous Waste Data Interrogator (HWDI) to subsequently aid identifying specialist waste management facility requirements and also aid the understanding of cross boundary movements of waste into and out of WYCA.

The Hazardous Waste (England and Wales) Regulations 2005 and the List of Wastes (England and Wales) Regulations (2005) set out what is defined as hazardous waste. Waste is classified as "Hazardous Waste" if it has characteristics that make it harmful to human health, or to the environment, either immediately or over an extended period of time.

Many such wastes are intrinsically hazardous because of the chemicals they contain (e.g. oils and solvents, battery acid) but some are hazardous because they have been contaminated by other sources (e.g. excavated soils into which oils and other material has leaked).

4.2 Data Sources

Data on hazardous waste is sourced from the 2015 Hazardous Waste Environment Agency Interrogator. There is a total of 208,918 tonnes of hazardous waste arisings in WYCA.

4.3 Baseline Hazardous Waste Arisings

The West Yorkshire Combined Authority recorded 208,918 tonnes of hazardous waste arisings (Table 12). This total includes wastes arising that are then deposited in West Yorkshire and wastes "exported" to other parts the UK for management. 68 tonnes were recorded as rejected (at management destination) and therefore are not included in the model baseline data as these wastes would have been returned to the producer or recorded as deposited at an alternative (hazardous) site. The largest tonnages of hazardous wastes are produced from organic process operations (23%), as construction and asbestos wastes (22%) and from waste/water treatment industrial processes (16%).

Hazardous waste arisings from West Yorkshire account for 4.2% of the national total for hazardous waste arisings in England which was 4,966,543 tonnes in 2015. Hazardous waste arisings are therefore in line with expected arisings in proportion to the populations of West Yorkshire and England as a whole (ONS population estimate 2014 West Yorkshire 2.16 million and England 54.3 million). Hazardous waste from organic process operations are higher than in many other sub-regions and reflect local industry specialisation.

Table 12 Hazardous Waste Arisings in West Yorkshire by Substance (2015)

Classification Hazardous Waste by Substance	Quantity (tonnes, rounded)
Agricultural and Food Production	29
Wood and Paper Production	29
Leather and Textile Production	4
Petrol, Gas and Coal Refining/Treatment	33
Inorganic Chemical Processes	1,762
Organic Chemical Processes	47,454
MFSU Paints, Varnish, Adhesive and Inks	3,347
Photographic Industry	267
Thermal Process Waste (inorganic)	400
Metal Treatment and Coating Processes	3,141
Shaping/Treatment of Metals and Plastics	2,594
Oil and Oil/Water Mixtures	12,391
Solvents	1,209
Packaging, Cloths, Filter Materials	10,146
Not Otherwise Specified	20,941
C&D Waste and Asbestos	45,074
Healthcare	7,079
Waste/Water Treatment and Water Industry	33,886
Municipal and Similar Commercial Wastes	19,132
Total	**208,918**

Hazardous waste is managed within WYCA in the majority by recycling, treatment and landfill (as shown in Table 13). Table 14 shows how all the hazardous waste in WYCA in 2015 was managed (included imports in addition to waste arisings within WYCA). This table shows that landfill and treatment are the overall management routes (reflecting the existence of hazardous landfill capacity and treatment capacity in 2015).

Table 13 Hazardous Waste Arisings in West Yorkshire by management method (2015)

Hazardous Waste Management Method	Quantity (tonnes, rounded)
Incineration with energy recovery	968
Incineration without energy recovery	5,852
Landfill	**43,026**
Recycling	**73,017**
Rejected	68
Transfer (D)	6,790
Transfer (R)	36,007
Treatment	**43,189**
Total	**208,917**

Table 14 Hazardous Waste arisings for each of the WPAs within West Yorkshire by management

Arising WPA	Bradford City	Calderdale	Kirklees	Leeds	Wakefield
Incineration with energy recovery	115		289	38	527
Incineration without energy recovery	1,633	125	2,448	665	980
Landfill	11,392	1,660	2,943	26,216	816
Recovery	29,316	1,266	14,680	11,900	15,855
Rejected	26	0	16	26	
Transfer (D)	1,475	544	1,442	2,373	955
Transfer (R)	3,429	1,487	3,634	17,896	9,562
Treatment	5,347	894	4,060	16,850	16,038
Total	**52,733**	**5,976**	**29,512**	**75,964**	**44,733**
Grand Total	**208,918**				

4.4 Hazardous Waste Imports and Exports

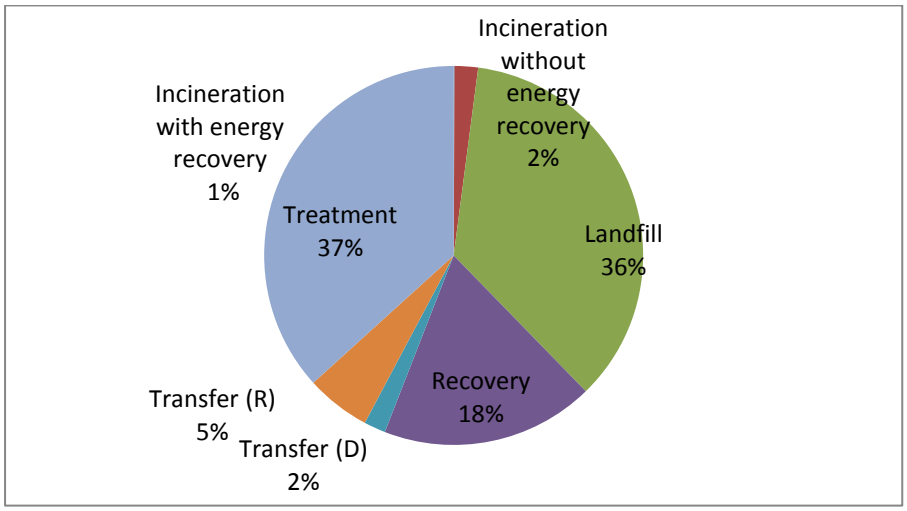
The movement of hazardous waste reflects the management of these specialised wastes at regionally or nationally significant facilities.

A total of 378,432 tonnes of hazardous waste were managed at facilities in West Yorkshire the majority by landfill (36%) or Treatment (37%) including 76,363 tonnes of the 208,918 arisings with the remainder imported into West Yorkshire for management (as shown in Table 15).

Table 15 Total Quantity of Hazardous Waste Managed in West Yorkshire 2015

Hazardous Waste Management Method	Arising & Managed in West Yorkshire (tonnes, rounded)	Total Managed Includes arisings and imports (tonnes, rounded)
Incineration with energy recovery		285
Incineration without energy recovery	1,172	7,560
Landfill	31,827	134,877
Recovery	14,316	68,889
Transfer (D)	3,075	7,000
Transfer (R)	11,536	20,847
Treatment	14,152	138,974
Total	**76,363**	**378,432**

Figure 4 Proportion of hazardous waste managed at different types of facility in WYCA Sub-Region (2015)



Some 302,069 tonnes are seen to be imported into WYCA (Table 16) with 132,555 tonnes exported in 2015 (Table 17). West Yorkshire is therefore a net importer of hazardous waste.

Table 16 Hazardous Waste Imports to West Yorkshire by waste type and by treatment method (tonnes)

Classification	Incineration without energy recovery	Landfill	Recycling	Transfer (D)	Transfer (R)	Treatment
Agricultural and Food Production					55	78
Wood and Paper Production			1			27
Leather and Textile Production			87			0
Petrol, Gas and Coal Refining/ Treatment				7		
Inorganic Chemical Processes		167	15	173	84	6,775
Organic Chemical Processes			16,450	220	60	73,617
MFSU Paints, Varnish, Adhesive and Inks		123	11,749	423	859	227
Photographic Industry			252	134	19	
Thermal Process Waste (inorganic)		5,413	0	0	8	1,089
Metal Treatment and Coating Processes		275	3,247	115	0	10,177
Shaping/ Treatment of Metals and Plastics		736	87	10	5	6
Oil and Oil/Water			110	65	639	62

Classification	Incineration without energy recovery	Landfill	Recycling	Transfer (D)	Transfer (R)	Treatment
Mixtures						
Solvents			912	80	190	17
Packaging, Cloths, Filter Materials	0	87	20	382	977	4
Not Otherwise Specified		239	9,531	301	1,881	9,442
C&D Waste and Asbestos		71,455		690	4	4,739
Healthcare	6,387		1	1,090	55	4,873
Waste/Water Treatment and Water Industry		24,554	2,135	90	2	13,680
Municipal and Similar Commercial Wastes	0		9,977	145	4,472	8
Totals	**6,388**	**103,050**	**54,573**	**3,925**	**9,311**	**124,822**
Grand Total	**302,069**					

Table 17 Hazardous Waste Exported from West Yorkshire showing management method (2015)

Methods used to Manage Hazardous Waste	Hazardous Waste Exports from WYCA (tonnes)
Incineration with energy recovery	685
Incineration without energy recovery	4,679
Landfill	11,199
Recovery	58,701
Rejected	68
Transfer (D)	3,715
Transfer (R)	24,471
Treatment	29,037
Total	132,555

Table 18 shows the destination WPA's that receiving in excess of 1000 tonnes of exported hazardous waste from West Yorkshire (92% of all hazardous waste exports).

Table 18 Destination WPA's of Hazardous Waste exported from West Yorkshire (2015) (tonnes) (over 1000 tonne movements)

Waste Planning Authority	Tonnes
East Sussex	24,186
Derbyshire	16,913
Lancashire	12,646
Rotherham	10,062
North Lincolnshire	8,605
Staffordshire	4,742
Cheshire West and Chester	4,106

Waste Planning Authority	Tonnes
Sheffield	3,487
Knowsley	3,466
Liverpool	3,315
Salford	3,253
Redcar and Cleveland	2,923
Sefton	2,873
Walsall	2,669
Stockton-on-Tees	2,368
Lincolnshire	2,164
North East Lincolnshire	2,059
York, City of	1,892
Sunderland	1,715
Northamptonshire	1,627
Trafford	1,556
Cheshire East	1,504
Nottinghamshire	1,216
North Yorkshire	1,168
Birmingham City	1,034
North Tyneside	1,034

4.5 Conclusion

The data on hazardous waste which will inform the Model will be based on the data from the 2015 Hazardous Waste Environment Agency Interrogator. This is the most accurate data available on this waste stream.

5 Agricultural Waste

5.1 Data Sources and methodology

In order to estimate agricultural waste arisings for WYCA, data has been extrapolated from the regional situation (Yorkshire and the Humber) using the relationship of agricultural land size and number of farm holdings and associated waste generation This work is extrapolated using the Defra annual agricultural census by region and farm type (published in 2013 for 2010 data) to gain the number of farm holdings and the Environment Agency Agricultural Waste and By-Products Survey 2003 (R&D Technical Report P1-399/1) to factor the waste tonnage. Although the EA Agricultural Waste and By-Products survey was carried out in 2003 following the detailed work in 2001 the practice of agricultural waste generation is not likely to have significantly changed since that time (and there is no useful more up to date survey at local authority level with detailed agricultural waste types to reference). It however should be appreciated that the figures presented are estimates at regional level and that the limited precision and availability of some of the data means that the accuracy of the final estimates cannot be guaranteed. In the original survey by the Environment Agency an assessment of the likely accuracy of the estimates was undertaken which

were defined as 'High', 'Medium' or 'Low'. Agricultural Waste arisings figures shown at regional level were estimated at predominantly medium accuracy level.

There are 12,035 farm holdings in Yorkshire and the Humber and 1881 holdings in WYCA (DEFRA Local Authority breakdown for key crop areas and livestock numbers on agricultural holdings 2010). Table 19 shows extrapolated waste arisings for the whole of Yorkshire and Humber based upon farm holdings number using the 2003 Environment Agency Agricultural Waste and By-Products Surveys.

Table 19 Estimates of Agricultural Waste Arisings in Yorkshire and the Humber, 2003 Environment Agency based upon 12,035 farm holdings

Waste type	Quantity (tonnes) Yorkshire and the Humber
Organic by-products (slurry & FYM)	6,865,230
Animal by-products	24,260
Packing Plastics	2495
Cardboard and paper packaging	770
Metal wood glass rubber packaging	3460
Plastic films & containers	3929
other non-packaging plastics	6381
cardboard sheet cores	51
agro chemicals	7098
animal health products	7277
Machinery waste	7769
Asbestos Cement Bonded Roof Sheeting	2160
Total	**6,930,880**

Table 20 shows the extrapolations of waste arisings for WYCA (the individual authorities within the North Yorkshire sub-region of Bradford, Calderdale, Kirklees, Leeds and Wakefield (based upon the assumption that each farm holding produces the same proportion and quantity of each waste type). The potential waste management treatment options for each waste type has also been estimated based upon current practice.

Table 20 Extrapolations of waste arisings (rounded) for WYCA based upon the number of farm holdings, DEFRA survey 2010 for Yorkshire and Humberside and EA Agricultural Waste and By-Products survey 2003 (tonnes)

Waste Type	Potential waste management Treatment route	West Yorkshire Quantity (tonnes rounded)
Packing Plastics	Recycling/Landfill	390
Cardboard and paper packaging	Composting on site/ Recycling/Landfill	120
Metal wood glass rubber packing	Recycling/Landfill	541
Plastic films & containers	Recycling/Landfill	614
Other non-packaging plastics	Recycling/Landfill	997
Card packaging bales	Recycling/Landfill	8
Agro chemicals	Treatment/Incineration	1109
Animal health products	Incineration	1137
Machinery waste	Recycling/treatment	1214
Asbestos Cement Bonded Roof Sheeting	Hazardous Landfill	338
Animal Health products	Specialist treatment	3792

Waste Type	Potential waste management Treatment route	West Yorkshire Quantity (tonnes rounded)
Total off farm		**10,260**
Organic by products slurry & FYM)	Composting/Land Recovery/ Treatment on site	1072995
Total on farm	**Totals on farm**	**1,072,995**
Total Agricultural Wastes	**Total Agricultural Wastes**	**1,083,256**

5.2 Waste Arisings Results

Table 21 summarises the waste arisings into common treatment routes, choosing for each category of waste the highest potential management route from the waste hierarchy i.e. identifying recycling in favour of landfill. This has recorded waste that is currently managed on site within the farm holding and that which should be managed off site.

Table 21 Potential Treatment routes for Extrapolated Waste Arisings for WYCA based upon farm holdings (2010) and the 2003 Environment Agency Agriculture Waste and By-products Survey (tonnes)

Waste Management Route (optimum route within the waste hierarchy has been chosen)	West Yorkshire Agricultural Wastes (tonnes rounded)
Management within farm holding	
Composting on site/ Land recovery/ Treatment on site	1,072,995
Management off site	
Recycling/Composting	3,885
Haz Treatment plant	1109
Incineration no EfW	4,929
Landfill	**0**
Hazardous Landfill	**338**
Total management off site	**10,261**
Total arisings	**1,083,256**

Table 22 Optimum waste management routes for agricultural management, West Yorkshire(tonnes)

Waste Management Route (optimum route within the waste hierarchy has been chosen)	Bradford	Calderdale	Kirklees	Leeds	Wakefield	Total WY
Management within farm holding						
Total management within farm holding	**243,577**	**258409**	**253275**	**194520**	**123215**	**1072995**
Management off site						
Recycling/composting	882	936	917	704	446	3885

Waste Management Route (optimum route within the waste hierarchy has been chosen)	Bradford	Calderdale	Kirklees	Leeds	Wakefield	Total WY
Haz Treatment	510	541	530	407	258	2246
incineration no EfW	861	913	895	687	435	3791
Landfill	0	0	0	0	0	0
Hazardous Landfill	77	81	80	61	39	338
Total management off site	**2,329**	**2471**	**2,422**	**1859**	**1178**	**10259**
Total arisings	**245,907**	**260880**	**255696**	**196379**	**124393**	**1083255**

For the purpose of planning for future capacity requirement the only waste that is required to be taken into account is that completely leaving the farm holding and therefore going "off-site" for management . The quantities involved are very small at just over 10,200 tonnes (10,261 tonnes). If the optimum route, according to the waste hierarchy for waste management is assumed there will be a requirement for very low capacity at specialist treatment facilities, hazardous landfill and recycling as shown in Table 22.

5.3 Conclusion

New legislation came into force in April 2010 amending the existing system of waste exemptions including agricultural waste exemptions currently undertaken by farmers. In some cases there may have resulted in slight changes to the limits and conditions within the waste exemption. There were also a number of new exemptions that could be applied to farming. There are approximately 30 exemptions covering agricultural activities, however approximately 12 are more significant with regard to waste management. There are 95 sites within WYCA with exemptions relating to activities on farm holdings that handle agricultural wastes the full list is contained in **Appendix 3**. The exemptions all relate to such activities undertaken within the farm holding and the waste quantities will be therefore be in addition to those recorded above in Table 21 as managed within the farm holding. The exempt activities include; depositing agricultural waste (land spreading), aerobic composting and associated prior treatment, anaerobic digestion at premises used for agriculture and burning resulting biogas, treatment of waste in a bio-bed or bio-filter, preparatory treatments (baling, sorting, shredding etc.), spreading waste to benefit agricultural land, using mulch, spreading plant matter to provide benefits, incorporating ash into soil, spreading of pig and poultry ash, treatment of kitchen waste in a wormery and treatment of sheep dip using organophosphate-degrading enzyme.

In addition to any effect of the updated exemption regulations which came into force in 2010, it is likely that in the future more waste may be diverted from landfill to recycling (due to the increasing awareness of the potential to recycle), however it is expected that the quantities involved will still be small and will be of low significance in the overall waste arisings for the Plan area for WYCA..

It is likely that the majority of agricultural waste will still be managed within the farm holdings via land treatment/spreading and composting. In looking at waste treatment for agricultural wastes managed off the farm holdings the optimum route for treatment using the waste hierarchy has already been chosen to reflect that in the future more waste can be diverted from landfill to recycling. It should be noted that a capacity allowance should be made to take into account the

specialised treatment requirements for certain types of agricultural waste such as incineration and hazardous landfill and that the figures reflect the optimum level of treatment according to the waste hierarchy and in reality some of the waste may not be able to be practically or cost effectively recycled and therefore require treatment by other methods such as landfill.

6 Low Level Non-Nuclear Radioactive Wastes

Radioactive waste is classified in the UK according to the level of radioactivity it contains and the heat that this radioactivity produces. It is categorised as High Level, Intermediate Level, Low Level or Very Low Level. Low Level Radioactive Wastes (LLRW) are covered by this report and these incorporate Very Low Level Radioactive Wastes. LLRW is defined as:

"Wastes having a radioactive content not exceeding 4 Gigabecquerels per tonne of alpha activity or 12 Gigabecquerels per tonne of beta/gamma activity[3]."

These wastes are typically produced by hospitals, academic and medical research establishments and arise in very small quantities. They can include used x-ray plates and similar materials and often include non-radioactive hazardous materials such as medical sharps.

The low level waste repository in Cumbria has been the disposal site for most LLRW produced in the UK since 1959. In addition, landfill sites have been able to accept LLRW for disposal alongside non-radioactive wastes but this is strictly controlled. More recently, activity has occurred to divert LLRW away from the Cumbria site by using different treatment and disposal options. These include metals recycling, incineration, direct disposal (i.e. 'immobilisation' and storage) and increased use of landfill[4].

6.1 Data Sources

Information about LLRW occurring in West Yorkshire is more limited than that for the principal controlled waste streams. Information is reported to the EA Pollution Inventory which includes the source, the materials produced and how they were disposed. In addition, radioactive limits, expressed in Becquerels, are also provided and the radioactive activity of the materials disposed of. This information does not make it possible to estimate quantities by weight although it is possible to identify the place of disposal.

The information reported below has been provided by the EA in response to a bespoke data request[5].

6.2 Waste Arisings Results and Conclusions

Data from the EA indicates that in West Yorkshire there are 15 sites permitted to dispose of LLRW and 14 of these produced LLRW in 2015 (as shown in Table 23). The information provided by the EA indicates that LLRW permits held by sites in West Yorkshire covers all forms of LLRW i.e. solids, liquids and gases. All solid LLRW are permitted for incineration at SRCL's Knostrop incinerator, in all but one case liquid LLRW are permitted for treatment at Yorkshire Water's Knostrop site, and

[3] Dept. for Business, Energy & Industrial Strategy/Nuclear Decommissioning Authority (2017) *Radioactive Wastes in the UK: Context and Methodology Report*

[4] UK Radioactive Waste Inventory *How do we manage radioactive waste?* [Accessed: 5517] Available at: https://ukinventory.nda.gov.uk/about-radioactive-waste/how-do-we-manage-radioactive-waste/

[5] https://data.gov.uk/dataset/pollution-inventory

gaseous LLRW are permitted to be disposed of to air on the sites at which they originated. Table 23 below shows the sites permitted to dispose of LLRW in West Yorkshire, the form this takes, the disposal route and the radioactive activity of the material disposed of in 2015. There are no details on volumes however an estimate has been made that the annual arisings of LLW in WYCA is not likely to exceed 100m^3.

It is considered unlikely that new facilities generating these materials will emerge locally and there are no known plans to develop nuclear infrastructure that would provide an alternative source. As a result the pattern of use and disposal is not expected to change during the time period

Table 23 Premises with Permits for the Disposal of Radioactive Waste, Disposal Methods & Routes (the limits expressed are for a variety of radioactive types) within WYCA.

Facility WPA	Operator	Premises Address	Waste Type	Release Route Type	Release Point Name	Disposal in 2015 (MBq)
Bradford City	Bradford (Teaching) Hospitals NHS Trust	Bradford Royal Infirmary	Aqueous	Sewage treatment works	Leeds - Knostrop STW outfall	397
Bradford City	University of Bradford	Richmond Road	Aqueous	Sewage treatment works	Leeds - Knostrop STW outfall	783
Kirklees	Calderdale and Huddersfield NHS Trust	Huddersfield Royal Infirmary	Aqueous	Sewage treatment works	Leeds - Knostrop STW outfall	243,210
Kirklees	Mid Yorkshire Hospitals NHS Trust	Dewsbury & District Hospital	Aqueous	Sewage treatment works	Leeds - Knostrop STW outfall	105
Leeds	Alliance Medical Limited	PET-CT Centre	Aqueous	Sewage treatment works	Leeds - Knostrop STW outfall	No reported disposal
Leeds	Covance Clinical Research Unit Ltd	Springfield House	Aqueous	Sewage treatment works	Leeds - Knostrop STW outfall	306
Leeds	Covance Clinical Research Unit Ltd	Springfield House	Gaseous	Gaseous disposal to air		1,603,182
Leeds	FCC Recycling (UK) Ltd	Knostrop Sewage Treatment Works	Aqueous	Sewage treatment works	Leeds - Knostrop STW outfall	1,351
Leeds	Idexx Reference Laboratory	Whittaker House	Aqueous	Sewage treatment works	Wetherby STW outfall	Below reporting threshold
Leeds	Leeds Teaching Hospitals NHS Trust	Leeds General Infirmary	Aqueous	Sewage treatment works	Leeds - Knostrop STW outfall	1,203,400
Leeds	Public Health England	Centre for Radiation, Chemical and Environmental Hazards	Aqueous	Sewage treatment works	Leeds - Knostrop STW outfall	0.004
Leeds	Public Health England	Centre for Radiation, Chemical and Environmental Hazards	Gaseous	Gaseous disposal to air		No reported disposal

Facility WPA	Operator	Premises Address	Waste Type	Release Route Type	Release Point Name	Disposal in 2015 (MBq)
Leeds	SRCL Ltd	Knostrop Clinical Waste Incinerator	Aqueous	Sewage treatment works	Leeds - Knostrop STW outfall	No reported disposal
Leeds	SRCL Ltd	Knostrop Clinical Waste Incinerator	Solid & organic liquid	On-site incineration		137,404
Leeds	The Hyperthyroid Cat Centre Ltd	432-433 Birch Park	Aqueous	Sewage treatment works	Leeds - Knostrop STW outfall	Below reporting threshold
Leeds	The Leeds Teaching Hospitals NHS Trust	St James's University Hospital	Aqueous	Sewage treatment works	Leeds - Knostrop STW outfall	No reported disposal
Leeds	University of Leeds	Woodhouse Lane	Aqueous	Sewage treatment works	Leeds - Knostrop STW outfall	2,566
Leeds	University of Leeds	Woodhouse Lane	Gaseous	Gaseous disposal to air		No reported disposal
Wakefield	Mid Yorkshire Hospitals NHS Trust	Pinderfields General Hospital	Aqueous	Sewage treatment works	Leeds - Knostrop STW outfall	16,057
Wakefield	Mid Yorkshire Hospitals NHS Trust	Pinderfields General Hospital	Gaseous	Gaseous disposal to air		131

7 Waste Water/Sewage Sludge

7.1 Data Sources

Responsibility for providing and managing infrastructure for the supply of drinking water, provision of public sewerage and the treatment, disposal and recycling of waste water lies with the statutory undertaker. This is Yorkshire Water plc, which is the principal provider of information about the scale of arisings and infrastructure for waste water and sewage handled within WYCA.

7.2 Waste Water Arisings and Management

According to data from the EA's Waste Data Interrogator, in 2015 there were nine Yorkshire Water sites in West Yorkshire treating sewage sludge. In 2015 this amounted to 375,000 tonnes.

Yorkshire Water has produced Asset Management Plans (AMP) to assess the future requirements for managing waste water and sewage sludge within West Yorkshire. The most recent of these (AMP-6) was completed at the end of 2014 and covers infrastructure requirements over the period 2015-2020. The next plan, for 2020-2025 is currently under development. In 2013, Yorkshire Water also published its long term strategic direction, covering 2015-2040, in which it predicted investment costs across the whole of the Yorkshire region of £20.8 billion serving a population that will have increased by 855,000.

There is one major development taking place, which is the construction of a new 50,000 tpa sludge treatment and anaerobic digestion facility at the Knostrop site, due for completion in 2019.. However, this will occur within the current site boundary so no further land will be needed.

Table 24 Yorkshire Water sites in WYCA listed in Waste Data Interrogator as receiving waste materials in 2015

Facility WPA	Site Name	Facility Type	2015
Bradford City	Esholt Wastewater Treatment Works	Biological Treatment	43,786
Calderdale	Brighouse Upper Sludge Treatment Facility	Physical-Chemical Treatment	216,340
Calderdale	Copley Sewage Sludge Treatment Plant	Biological Treatment	27,495
Kirklees	Neiley Sludge Treatment Facility	Physical-Chemical Treatment	4,577
Leeds	Lemonroyd Sludge Treatment Facility	Physical-Chemical Treatment	49,019
Leeds	Knostrop Wastewater Treatment Works	Composting	1,089
Wakefield	South Elmsall Sludge Treatment Facility	Physical-Chemical Treatment	5,518
Wakefield	Wheldale Sludge Treatment Facility	Physical-Chemical Treatment	3,547
Wakefield	Caldervale Wastewater Treatment Works	Biological Treatment	80
Wakefield	Mitchell Laithes Wastewater Treatment Works	Biological Treatment	27,186

According to Yorkshire Water, work will take place between 2017 and 2020 at a number of its wastewater treatment sites. This will not require extra land but will increase the amount of sewage sludge produced. This increase is accounted for and will be treated using the current asset base noted above, with the addition of the new AD facility at Knostrop. Table 25 lists the facilities at which there will be an increase in the amount of sewage sludge produced.

Table 25 Yorkshire Water sites in West Yorkshire at which work will be undertaken leading to an increase in the amount of sewage sludge produced

Wastewater Treatment Works	Facility WPA
Denholme No. 2	Bradford City
Clayton West	Kirklees
Otley	Leeds
Thorp Arch	Leeds
Wetherby	Leeds
Mitchell Laithes	Wakefield
West Bretton	Wakefield

7.3 Conclusions

Any additional requirement would be for land to accommodate waste water treatment facilities (sewage treatment works) and for sewage sludge plants which process semi-solid waste residues from treatment. Discussion with Yorkshire Water during the production of this report noted that there are no development plans for West Yorkshire that require additional land up to the end of the period covered by the next AMP (i.e. to 2025). Nevertheless it will be prudent for the Plan to include a generic strategic policy supporting future allocation of land to enable expansion of this infrastructure if this is required in the period after 2025 to meet an identified need.

8 Cross Border Movements

National Planning Policy (NNP) for Waste (October 2014) states that in preparing local plans, waste planning authorities should: Work jointly and collaboratively with other planning authorities to collect and share;

• date and information on waste arisings, and take account of waste arisings across neighbouring waste planning authority areas…..When identifying need for waste management facilities waste planning authorities

Whilst there is no definitive list of actions provided on what constitutes effective cooperation, the national Planning Practice Guidance identifies the following examples: gathering, evaluating and ensuring consistency of data and information

• required to prepare local plans, including the joint commissioning and preparation of evidence base studies;

• actively engaging in dialogue on those types and wastes or waste

• management facilities necessary that impact most on neighbouring authorities;

• active engagement, where necessary, with planning authorities wider than just immediate neighbours;

• Joint monitoring of waste arisings and capacity;

• Integrated working between county and district planning authorities.

This section of the report, using the 2015 EA Waste Data Interrogator and Hazardous Waste Data Interrogator, therefore analyses the cross boundary movements to and from West Yorkshire . Background data has been gathered to review the impact of imports and exports. The threshold for including non-hazardous waste movements in this report is 5,000 tonnes and 1,000 tonnes[6] for hazardous material.

8.1 Imports to the Sub-Region

The EA Waste Data Interrogator includes data on waste origins and the destinations of waste removed from permitted sites. This enables some estimation of cross boundary movements but must be treated with caution as the data recording by site operators is incomplete. Data on waste origin within the Interrogator can be entered at District, Waste Planning Area and Regional Levels. Some operators only enter at regional level i.e. Yorkshire and Humberside, whilst there are also deposits with no origin recorded.

Table 26 shows that the total waste managed at permitted sites in West Yorkshire was almost 7 million tonnes (6,992,644). The raw data indicated that a total of 1,027,440 tonnes of Household, Industrial and Commercial waste was recorded as originating only at regional level as Yorkshire and Humberside (the WDI data does not differentiate LACW from Household Industrial & Commercial waste). However, detailed analysis shows that most of this was waste managed through sites providing the capacity for LACW waste and thus a significant quantity of West Yorkshire LACW (808,510 tonnes identified) was recorded at this regional level. Taking this into account the quantity of Household, Industrial and Commercial waste of uncertain origin is reduced to 218,599 tonnes.

The uncertainty of origin means that waste "imported" for management within WYCA lies somewhere between 14% and 23% of the total managed for Household, Industrial and Commercial waste and 24% and 39% for inert construction, demolition and excavation waste.

The requirements of the Hazardous Waste Regulations mean that such levels of uncertainty are not seen for hazardous waste and it can be seen that West Yorkshire is a net importer of hazardous waste importing 302,068 tonnes for management (with 132,555 tonnes exported see Hazardous section of report).

Table 26 Total Waste Managed at permitted waste sites in WY (from detailed analysis of WDI 2015 (tonnes))

	Hazardous	Household/ Industrial/ Commercial	Inert/ C+D	Totals
Total Deposits in West Yorkshire	378,432	3,274,672	3,339,541	6,992,644
Coded as Yorkshire and Humberside		218,599	515,556	734,155
WPA Not Codeable		57,453	8,137	65,590
Import Known Origin		468,499	791,705	1,260,204

Tables 27, 28 and 29 show the origin of waste deposited at permitted sites in West Yorkshire in 2015 where the total from another WPA exceeded 5,000 tonnes for non-hazardous waste and 1,000 tonnes for hazardous waste.

[6] Thresholds for co-operation on waste movements should relate to significant quantities (tonnages) and thus for non-hazardous waste movements in excess of 5,000 tonnes and 1,000 tonnes for hazardous materials are considered to be significant.

Table 27 C&I Waste Imports to WYCA (2015) Data in Tonnes (Rounded to nearest tonne)

Authority	Tonnes
North Yorkshire	97,761
East Riding of Yorkshire UA	73,164
WPA Not Codeable (Not Codeable)	57,453
Sheffield	37,358
Kingston Upon Hull UA	33,167
North Lincolnshire UA	20,238
WPA not codeable (North East)	19,840
Manchester	19,367
Derbyshire	19,297
Doncaster	15,815
Lancashire	15,038
Rotherham	14,076
Nottinghamshire	12,479
Lincolnshire	9,468
Barnsley	8,425
WPA not codeable (Wales)	5,335

Table 28 CD&E Waste Imports to WY (2015) Data in Tonnes (Rounded to nearest tonne)

Authority	Tonnes
WPA not codeable (North East)	232,041
East Riding of Yorkshire UA	96,103
Essex	44,061
Doncaster	43,570
Hampshire	37,299
Manchester	34,183
Norfolk	19,801
North Yorkshire	19,748
Barking & Dagenham	16,416
Devon	16,220
Sheffield	16,085
WPA not codeable (West Midlands)	15,582
Barnsley	14,743
Warwickshire	14,362
York UA	12,114
St Helens	8,503
WPA Not Codeable (Not Codeable)	8,137
Surrey	7,942
Wiltshire	7,892
Rotherham	7,888
Cumbria	7,590
Scottish WPA	7,428

Authority	Tonnes
WPA not codeable (London)	7,034
Northamptonshire	5,952
Peterborough UA	5,701
Derbyshire	5,449
East Sussex	5,051

Table 29 Hazardous Waste Imports to WY (2015) Data in Tonnes (Rounded to nearest tonne)

Authority	Quantity (Tonnes)
Knowsley	67,950
Sheffield	42,239
Flintshire	25,486
East Riding of Yorkshire	22,226
North East Lincolnshire	10,556
Falkirk	10,469
Trafford	7,672
Lincolnshire	6,329
North Yorkshire	5,704
Kent	5,387
Rotherham	4,419
Norfolk	4,315
Lancashire	4,041
Plymouth	3,655
Salford	3,515
Doncaster	3,475
Derbyshire	3,442
Stoke-on-Trent City	3,077
Kingston Upon Hull City	3,058
Manchester	2,925
Nottinghamshire	2,587
North Lincolnshire	2,294
Cambridgeshire	2,107
St Helens	2,056
Cheshire East	2,007
Northumberland	1,975
York, City of	1,963
Liverpool	1,952
Cumbria	1,948
Suffolk	1,737
Rochdale	1,679
Leicestershire	1,559
East Sussex	1,551
Gateshead	1,371

Authority	Quantity (Tonnes)
Walsall	1,301
Barnsley	1,299
Stockport	1,283
County Durham	1,145
Cheshire West and Chester	1,136
Halton	1,105
Nottingham City	1,101
Hampshire	1,055
Sandwell	1,033
Barking and Dagenham	1,017

8.2 Exported Waste from West Yorkshire

The total quantities of waste exported from WY were 801,005 tonnes in 2015. Of this, 518,088 tonnes is household, industrial & commercial waste, 150,362 tonnes of inert construction demolition and excavation waste and 132,555 tonnes classified as hazardous waste.

Table 30 shows exports of household, industrial & commercial exceeding 5,000 tonnes from West Yorkshire from records at sites located in England and Wales other than in West Yorkshire 2015. Table 31 shows confirmed exports of inert construction demolition and excavation waste exceeding 5,000 tonnes from West Yorkshire from records at sites located in England and Wales other than in West Yorkshire and the remaining table showing exports of Hazardous waste from West Yorkshire all in 2015.

Table 30 Exports of Household Industrial & Commercial waste (exceeding 5000 tonnes) from WY 2015

Waste Planning Authority	Quantity (Tonnes)
Stockton-on-Tees WPA	119,683
Doncaster WPA	79,802
Sheffield WPA	52,991
North Yorkshire WPA	34,498
East Riding of Yorkshire WPA	26,258
Redcar and Cleveland WPA	25,626
County Durham WPA	25,546
Derbyshire WPA	21,818
Barnsley WPA	20,350
Kingston Upon Hull City WPA	18,061
North East Lincolnshire WPA	13,296
North Lincolnshire WPA	10,678
Rotherham WPA	8,520
Trafford WPA	8,405
Birmingham City WPA	8,185
Nottingham City WPA	7,964
Warrington WPA	7,276

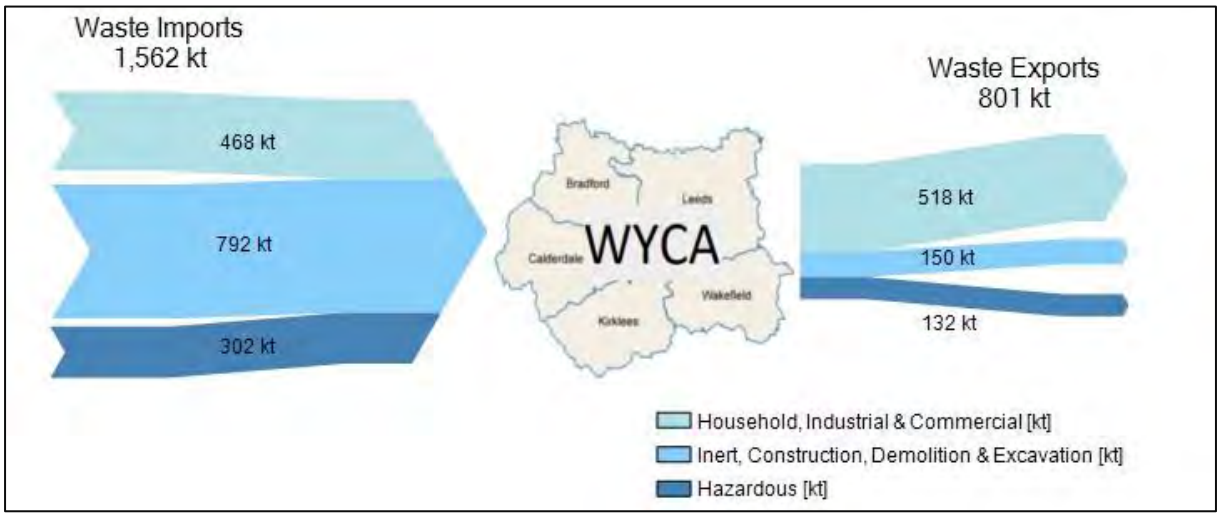
Table 31 Exports of Inert Construction Demolition and Excavation waste (exceeding 5000 tonnes) from WY in 2015

Waste Planning Authority	Quantity (Tonnes)
Doncaster WPA	72,929
Barnsley WPA	15,466
North Yorkshire WPA	14,242
Rotherham WPA	10,482
Sheffield WPA	10,314
Stockport WPA	6,669
Nottinghamshire WPA	6,262
East Riding of Yorkshire WPA	4,788

Table 32 Exports of Hazardous waste (exceeding 1000 tonnes) from WY in 2015

Waste Planning Authority	Quantity (Tonnes)
East Sussex	24,186
Derbyshire	16,913
Lancashire	12,646
Rotherham	10,062
North Lincolnshire	8,605
Staffordshire	4,742
Cheshire West and Chester	4,106
Sheffield	3,487
Knowsley	3,466
Liverpool	3,315
Salford	3,253
Redcar and Cleveland	2,923
Sefton	2,873
Walsall	2,669
Stockton-on-Tees	2,368
Lincolnshire	2,164
North East Lincolnshire	2,059
York, City of	1,892
Sunderland	1,715
Northamptonshire	1,627
Trafford	1,556
Cheshire East	1,504
Nottinghamshire	1,216
North Yorkshire	1,168
Birmingham City	1,034
North Tyneside	1,034

Figure 5 Sankey Diagram showing imports and Exports to WY Plan Area



Stage 2. Subsequent Stages in Modelling Capacity Requirements

The purpose of the work summarised in this section of the report is to establish the baseline estimates of how wastes are currently being managed and how much waste is being created locally as a basis for future forecasting in the modelling. Table 33 gives total recorded waste deposits at sites in WYCA that are subsequently used for modelling purposes (figures are categorised to be located within the correct waste stream to avoid double counting).

Table 33 Total recorded waste deposits at sites in WY (2015)

Facility Type	LACW (HH/NHH)	LACW SECONDARY	AGR	C&I	CD	E	HAZ
Composting	115,260	25,649					
Recycling	204,724	44,742	3885	1,710,478			108,401
Recycling Metals				278,910			
Recycling CD&E		35,658			459,063	244,539	
Residual MRF	369,993						
Treatment			6,038	196,471			
Hazardous Treatment							43,189
Mechanical Biological Treatment	41,370						
RDF, Autoclave, MHT or similar		2,829					
Energy from	123,851	293,941		2,808			853

Facility Type	LACW (HH/NHH)	LACW SECONDARY	AGR	C&I	CD	E	HAZ
Waste							
Incineration no energy recovery							5,851
Inert Landfill		795			112,384	1,235,709	
Non-Hazardous Landfill	72,288	115,345		283,914			
Hazardous Landfill		618	338				50,437
Totals	**927,486**	**519,577**	**10,261**	**2,472,581**	**571,447**	**1,480,248**	**208,731**

[Source: Environment Agency Waste Data and Hazardous Waste Data Interrogators, 2015, WasteDataFlow, Agricultural wastes see section 5 of this report]

Table 34 Summary of Baseline Estimates of Waste Arisings by Stream, 2015 (tonnes) WY

Principal Waste Arisings Year 2015	Tonnes
Agricultural Waste (leaving farm units)	10,261
Commercial & Industrial Waste	2,472,581
Construction & Demolition (managed off-site)	571,447
Excavation	1,480,248
LACW household	916,959
LACW Non-Household (excludes commercial/trade, Haz, CD&E)	10,527
LACW Secondary	519,577
Hazardous	208,731
Total	**6,190,331**

[Source: Environment Agency Waste Data and Hazardous Waste Data Interrogators, 2015, Waste Data Flow, Agricultural wastes see section 5 of this report]

9 Predicting Future Requirements, developing scenarios

As part of the forecast of future waste capacity requirements, a number of scenarios are considered that reflected a realistic range of possibilities that could be implemented to influence waste management arisings. In developing the scenarios certain assumptions were made, in particular how, in general terms, the various categories of waste arisings would be managed in the future.

The modelling considered three waste management scenarios:

- Scenario 1 – baseline, which reflects the current status and forward planning position.
- Scenario 2 – maximised recycling of C&I and CD wastes over plan period and 50% recycling/composting of LACW by 2020
- Scenario 3 – a median level of increased recycling of C&I and CD over the plan period with the same 50% recycling/composting target for LACW by 2020

In addition to the 3 scenarios, modifier factors have been selected as shown in Table 35 to reflect future uncertainties and their scale that could influence the future quantity of waste arisings and their subsequent management. These factors seek to reflect future economic activity and projections on Gross Value Added (GVA) outcomes), fiscal/financial/legislative factors (landfill tax charges driving waste away from landfill).

The growth factors used for Commercial & Industrial wastes (including LA collected commercial waste) and construction, demolition and excavation waste are based on GVA and employment data provided by the Regional Economic Intelligence Unit of the West Yorkshire Combined Authority. Historical data shows that whilst there is a correlation between GVA and waste growth, actual waste growth is lower than GVA and thus for "Growth" scenarios C&I waste growth at 33% of GVA growth annually has been used. Under a "growth" scenario this would result in a 15% growth in Commercial & Industrial waste arisings from between 2016 baseline to the year 2036. For "Minimised Growth" scenarios the growth factor was halved to 16.5% of GVA growth.

With respect to LACW waste the waste growth factors used have been equated with population growth. The data used was from 2014 ONS published data for the West Yorkshire authorities. Under a "growth" scenario this would result in a 10.5% growth in LACW waste arisings above a 2016 baseline by the year 2036. For "Minimised Growth" scenarios the growth factor used was reduced to 50% of the population growth.

Table 35 Modifier Factors

Growth Value	Modifier Value
NO GROWTH	All wastes no growth
GROWTH	Commercial & Industrial wastes (including LA collected commercial waste) – growth @ 33% projected GVA growth CD&E wastes – growth @ 33% projected GVA growth Hazardous wastes – growth @ 33% projected GVA growth Agricultural– no growth LA Collected Household Waste – growth projections in proportion to population growth Secondary LACW - growth projections in proportion to population growth
MINIMISED GROWTH	Commercial & Industrial wastes – growth @ 16.5% projected GVA growth CD&E wastes – growth @ 16.5% projected GVA growth Hazardous wastes - growth @ 16.5% projected GVA growth Agricultural– no growth LA Collected Household Waste – growth projections in proportion to 50% of population growth Secondary LACW - growth projections in proportion to 50% of population growth

Modelling the change of practice in the management of waste arisings must also consider the increasing recycling potential resulting from changes in practice of waste collection, processing and treatment. There are increasing opportunities for recycling or energy recovery from commercial and industrial mixed waste which is not currently source segregated. A series of three factors have therefore been chosen to reflect the potential changes in recycling and energy recovery as shown in

Table 36. Scenario 1 reflects the current baseline position and assumes this remains throughout the plan period. Scenario 2 reflects a maximised approach to recycling through proposing to achieve levels of 86.5% by 2036 for Commercial Waste and Industrial Waste as this represents a high level of recycling but also reflects the practicality that not all mixed waste can be recycled, with 2% of mixed waste going to energy recovery, 8.5% treatment and a very small proportion of 3% to landfill. Scenario 3 reflects a median level of recycling and landfill. This median scenario seeks to achieve recycling levels of 85.5% for Commercial Waste and Industrial Waste with landfill at 5% by 2036.

Table 36 Change in Practice Modifiers

Behaviour change	Modifier Value WY
BASELINE	All wastes no change. Baseline recycling based on 80% Commercial and Industrial with 8% Treatment, less than 1% recovery. and the remainder 11% to landfill LACWHH with contribution from Secondary Recycling based on composting/recycling 39%, Recovery 14% and landfill 20% (remainder MBT/Residual MRF). Construction & Demolition 80% recycling, 20% landfill Excavation recycling 17%, 83% landfill (majority capping/cell preparation/land restoration) Hazardous 52% recycling, 24% landfill, 21% treatment, 3% incineration ne energy recovery, less than 1% energy recovery. Agricultural wastes 38% recycling, 59% treatment, 3% hazardous landfill
MAXIMISED RECYCLING and MINIMUM LANDFILL SCENARIO 2	C&I By 2020 82% Recycling, 2% EfW, 8% Treatment 8% Landfill By 2036 86.5% Recycling, 2% EfW , 8.5%, Treatment 3%Landfill LACWHH/Secondary (appropriate wastes) By 2020 50% recycling, 10%landfill (with contribution from Secondary as appropriate) and continue for the remaining plan period. Construction & Demolition By 2020 85% recycling, 15% landfill By 2036 90% recycling, 10% landfill Excavation Wastes, Agricultural and Hazardous wastes no change as baseline
MEDIAN RECYCLING AND MEDIAN LANDFILL SCENARIO 3	C&I By 2020 81% recycling, 1% EfW, 8% Treatment, 10% Landfill By 2036 85.5% recycling, 1% EfW, 8.4% Treatment, 5% Landfill LACWHH/Secondary (appropriate wastes) By 2020 50% recycling, 10% landfill (with contribution from Secondary as appropriate) and continue for the remaining plan period. No change to maximised scenario Construction & Demolition By 2020 82% recycling, 18% landfill By 2036 85% recycling, 15% landfill Excavation Wastes, Agricultural and Hazardous wastes no change as baseline

Scenarios have therefore been modelled using the 3 sets of modifier factors (no growth, maximised growth and minimised growth) with the 3 changes in practice modifiers (Baseline, Maximised and Median recycling and recovery) to produce 9 outcomes with a range of different capacity requirements depending on how waste is managed within the waste management hierarchy.

The capacity of all the available sites with planning permission for waste management are included in the model, together with information on annual capacity of the site and duration of activity according to the planning permissions. The existing sites were identified through a review of the list of sites identified from the EA Waste Data Interrogator (2015), and the list of permitted waste sites as supplied by the EA. The final list for was sent to the councils of WYCA to provide any further information from the planning permission regarding the capacity and end date of each site.

For all sites included in the model, the capacity information was taken from the EA licence, Planning Permission information where available, and EA permits. However it is important to note that this information does not always correlate due to the way in which the EA issues its waste licences (the EA uses standard maximum capacity limits) and therefore a review of past annual throughputs was also undertaken to ascertain the most accurate information for the available capacity at each site. This figure, once agreed with WYCA is the figure used for available capacity at that site.

A comparison of the capacity gap at 2017, 2020 and at the end of the plan period (2036) across the scenarios is shown in Tables 41 - 46 (full year by year results are within **Appendix 2**).

Utilising the latest data (collected as at June 2017), existing capacity information was assembled and collated into a Waste Facility Capacity Database and used to inform the future waste capacity requirements. The capacity database represents the best available information as supplied by the WYCA. A summary of available capacity is set out in Table 37[7]. Capacity shown is assumed to be available for the duration of the plan unless information on end dates has been provided. There are three hundred and thirty five operational waste management facilities in WYCA, an additional seventeen sites that either have planning permission and not yet built/identified sites/other issues, and of the 335 sites , seven are restricted in the types of waste they can take (the majority of these are sludge treatment works).

Table 37 Available Waste Capacity in WY (Rounded Tonnes) 2017

Waste Types	Facility Type	Annual Capacity
LACWHH, LACWNHH, LACW Secondary	Composting	139,851
C&I, ALL LACW	Recycling	1,220,007
LACWHH, C&I	Recycling/Residual MRF	172,033
CD & E	Recycling CD & E	850,022
LACWHH/NHH,CD&E	Recycling/Recycling CD&E	222,479
LACWHH	Residual MRF	817,076
Haz	Hazardous Recycling	88,987
Haz, C&I	Hazardous Treatment/Treatment	320,630
C&I	Treatment	338,591
CD & E	Recycling CD& E/Treatment	9,442

[7] Capacity is based on average annual capacity based on past years performance and NOT on EA licensed capacity figures as this is not considered the most accurate figure for calculating actual available capacity due to the way in which the EA licence system works.

Waste Types	Facility Type	Annual Capacity
C&I	Recycling Metals	682,058
C&I	Restricted Recycling/Treatment	352,456
Haz, C&I	Hazardous Treatment/Recycling	18,578
LACW HH	Mechanical /Biological Treatment	42,185
LACWHH	RDF/Autoclave/MHT or Similar	570,000
LACW HH, LACW Secondary	Energy from Waste	332,000
Haz	Incineration (no energy recovery)	10,000
CD, E, LACW Secondary inerts	Inert Landfill	1,104,749
C&I, ALL LACW	Non-Hazardous Landfill	994,520
Haz, CD	Hazardous & Non-Hazardous Landfill	76,297
Haz, Agr, LACW Haz, LACW Secondary Haz	Hazardous Landfill	257,919
All Wastes	Transfer Facilities	835,098
Total		**9,454,981**

[Sources: Environment Agency Waste Data Interrogators 2006-2013 supplemented by results of a survey undertaken for this assessment]

It is recommended that WYCA consider the implications and requirements of each of the proposed scenarios and select one set for the purposes of planning for future waste facilities. The waste modelling process has taken into account both active existing sites and also sites with planning permission but not yet constructed or operational which could all help provide capacity. The model can be run at any time with existing and potential sites included or excluded in order to understand how changes to individual site status would affect the overall level of provision, for instance if a site subsequently closes the model can be adjusted accordingly. New sites that arise that are not included in the modelled list can also be added and the model run under the various scenarios. Table 38 shows sites within the model but not selected in the capacity results as not yet built or operational.

Table 38 WY Sites not yet operational within WY

Site Name	Facility type	Status	Known Capacity/limitations
Biogen/Energos Ripley Road	Gasification	Planning permission granted 2010 and renewed in 2013	160,000 tonnes of C&I waste only
Land east of former gas works site Airedale Road, Marley, Keighley Halton Group Bradford WDA	EFW and Pyrolysis.	Planning submitted to Bradford Council November 2013 – granted – further application for a larger building refused in August 2015 but another further app in Aug 2016	Use only processed C&I as RDF feedstock. 130, 000 te (90,000 te RDF, 10,000 te tyre crumb, 30,000 te waste plastics)

Site Name	Facility type	Status	Known Capacity/limitations
		granted in Feb 2017 but this is currently subject to a JR	
Belmont Industrial Estate , Sowerby bridge Calderdale WDA	EfW		10,000 tonnes of C&I
Haigh Park Road, Sturton Leeds WDA	Treatment Facility	Planning permission not yet approved	75,000 Tonnes CD&E
Knotford Nook Leeds WDA	Composting Facility	Safeguarded site	
Moor Top Quarry Leeds WDA	Landfill	Safeguarded site	
Odda Quarry Leeds WDA	Landfill	Safeguarded site	
Skelton Grange Energy from Waste Leeds WDA	EfW	Not yet constructed	300,000 tonnes potentially LACWHH, LACW Secondary, C&I
Swillington Quarry Leeds WDA	Landfill	Inert Landfill	

[Sources: WYCA; desk research of industry news sites]

It is recommended that the WYCA includes, within any papers utilising this evidence information on existing capacity and an indication of the number, scale and potential location for any facilities indicated as required to meet future capacity needs as informed by this Report.

10 Future Capacity Requirements Introduction

Waste is generated by a vast range of processes although people are most familiar with waste collected from their households, such as packaging and food. However, these wastes (officially named Local Authority Collected Waste or LACW) only account for part of the overall waste arisings. Much larger quantities of other waste from the construction industry, such as concrete, broken bricks and excavated soils, wastes from the commercial sector, such as packaging, food from restaurants and waste from industrial processes make up the total amount of waste produced within WYCA. The majority of waste is produced as a result of producer demand for products and an important aspect of reducing the overall production of waste is through behavioural changes in how individuals consumer goods and services.

The need for waste management facilities to deal with the wastes in a more sustainable way will form an integral part of any papers . This section of the report considers two key issues: How much waste will need to be managed over a period (to 2036) and what facilities will be required to manage this waste.

This part 2 of the report sets out the expected waste management capacity that will be provided by waste facilities over a set period, as well as expected waste arisings over the same period. If the expected arisings are greater than the known waste management capacity then the difference in values is called the ‘capacity gap'. Where the expected arisings are smaller than the known waste

management capacity, this is called a 'surplus in capacity'. The capacity gap is what WYCA will need to plan for . 'Capacity requirements' shows what is needed to be provided to meet expected levels of waste arising over the plan period for each management type for example composting, recycling etc. The capacity gap is what is needed after capacity at existing facilities is used.

This Part 2 of the report provides information on waste arisings for the principal waste streams namely, C&I, CD& E, LACW, hazardous, agricultural, waste water and sewage, and low level radioactive waste, and identifies where there may be a capacity gap up until 2036. Not only does the projection of future waste capacity requirements look at waste arisings and their management but also the potential for recycling or energy recovery with the aim of managing waste more sustainably and moving it up the waste hierarchy.

This approach is consistent with the Government's sustainable development agenda generally and their approach to delivering sustainable waste management in particular. National Planning Policy for Waste 2014 (NPPW) refers to a key planning objective of *"delivery of sustainable development and resource efficiency, including provision of modern infrastructure, local employment opportunities and wider climate change benefits, by driving waste management up the waste hierarchy"* .The Waste Hierarchy has been transposed into UK law through the Waste (England and Wales) Regulations 2011.

The need to decouple waste growth from economic growth has its roots in the need for sustainable development in the UK, particularly the idea of sustainable production and consumption of resources. By implementing the principles of the waste hierarchy, there will be a move towards reducing the amount of waste produced in the first place, thus helping to break the link.

Figure 6 The Waste Hierarchy

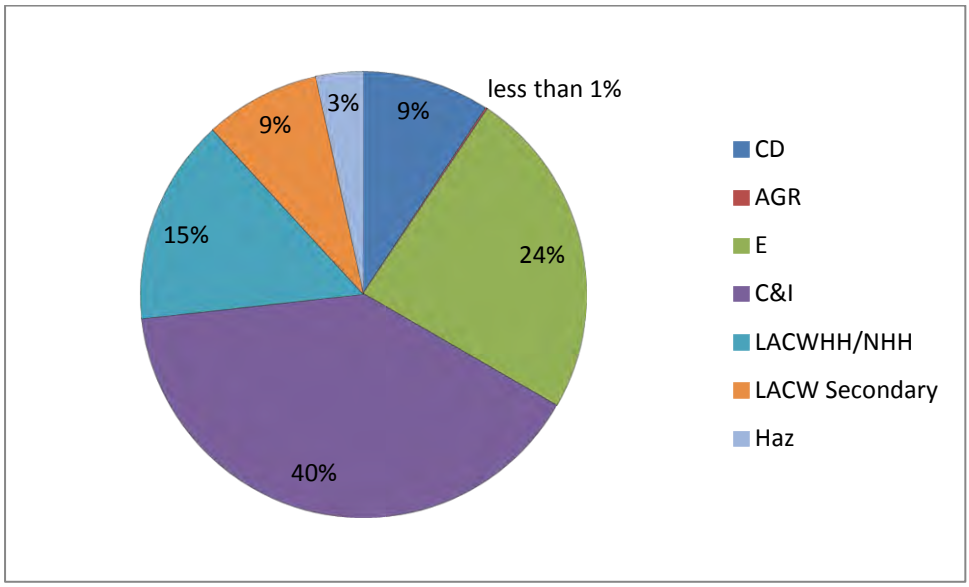
Source: www.Defra.gov.uk

10.1 Principal Waste Streams

Figure 7 and Table 39 show the relative sizes of the principal waste streams arising in the WYCA (Data: 2015 Arisings from Stage 1 of this report adjusted to avoid double counting for modelling purposes (taking out trade/commercial waste figures from LACW figures, taking out any CD&E/Hazardous from LACWNHH)). They do not include waste water and sewage and low level

radioactive wastes, inclusion of which will distort the quantities for which capacity needs to be provided as they do not constitute principal waste arisings for WYCA. Managing these streams requires specialist facilities which are detailed later in this report.

Figure 7 Proportion of principal waste streams in WYCA, 2017



[Sources: Environment Agency Waste Data Interrogator 2015, WasteDataFlow and extrapolations to 2017]

Table 39 WYCA Waste Arisings (tonnes rounded)

Principal Waste Arisings Year 2017	Tonnes (rounded)
CD (Construction & Demolition)	571,447
AGR (Agricultural)	10,261
E (Excavation)	1,480,248
C&I (Commercial & Industrial)	2,472,581
LACWHH/NHH (LACW Household/Non Household)	927,486
LACW Secondary (Secondary waste after initial treatment)	519,577
Haz (Hazardous)	208,731
Total	**6,190,331**

[Sources: Environment Agency Waste Data and Hazardous Waste Data Interrogators 2015, and WasteDataFlow 2015/16 and extrapolations to 2017]

11 Predicting Future Requirements - modelling

As part of the forecast of future waste capacity requirements, a number of scenarios were considered that reflected a realistic range of possibilities that could be implemented. In developing the scenarios certain assumptions were made, in particular how, in general terms, the various categories of waste arisings would be managed in the future. In terms of growth 3 scenarios have been selected; baseline position (zero growth), maximum growth and minimised growth (see Table 35). The Baseline arisings under maximised growth and minimised growth are shown in Table 40.

The modelling considered three waste management scenarios to reflect changes in behaviour:

- Scenario 1 – baseline, which reflects the current status and forward planning position.
- Scenario 2 – maximised recycling and diversion from landfill of C&I and CD&E wastes.
- Scenario 3 – a median level of increased recycling.

Modelling the change of practice in the management of waste arisings must also consider the increasing recycling potential resulting from changes in practice of waste collection, processing and treatment, particularly for commercial and industrial waste. Scenarios have therefore been modelled using the 3 sets of modifier factors (no growth, growth and minimised growth) with the 3 changes in practice modifiers (Baseline, Maximised and Median recycling and recovery) to produce 9 outcomes with a range of different capacity requirements depending on how waste is managed within the waste management hierarchy.

A comparison of the capacity gap at the end of the plan period across the scenarios is shown in Tables 41-43.

Table 40 Annual Waste Arisings Forecasts Under the Growth and Minimised Growth Assumptions at key intervals across the plan period for WY (Baseline position).

Material Stream	2017	2020	2025	2030	2035	2036
Growth						
AGR	10,261	10,261	10,261	10,261	10261	10,261
C&I	2,505,727	2,547,445	2,653,824	2,743,550	2,829,206	2,845,889
CD	579,107	588,749	613,335	634,072	653,868	657,723
E	1,500,091	1,525,067	1,588,752	1,642,467	1,693,747	1,703,734
Haz	211,529	215,051	224,031	231,606	238,837	240,245
LACW Secondary	525,936	534,666	548,206	561,051	572,194	574,314
LACWHH	928,182	943,589	967,483	990,152	1,009,819	1,013,560
LACWNHH	10,656	10,833	11,107	11,367	11,593	11,636
Total	**6,271,489**	**6,375,661**	**6,616,999**	**6,824,526**	**7019,525**	**7,057,362**
Minimised Growth						
AGR	10,261	10,261	10,261	10,261	10,261	10,261
C&I	2,489,129	2,509,793	2,561,769	2,604,788	2,645,200	2,645,278
CD	575,272	580,047	592,059	602,002	611,342	611,360
E	1,490,155	1502,526	1,533,642	1,559,396	1,583,589	1,583,635
Haz	210,128	211,872	216,260	219,892	223,303	223,310
LACW Secondary	522,752	527,078	533,719	539,992	545,333	546,343
LACWHH	922,562	930,198	941,917	952,987	962,414	964,197
LACWNHH	10,591	10,679	10,814	10,941	11,049	11,069
Total	**6,230,850**	**6,282,454**	**6,400,441**	**6,500,259**	**6,592,491**	**6,595,453**

Table 41 Comparison of the Capacity Gap at year 2017, 2020 and 2036 across the 3 scenarios, assuming NO GROWTH for all wastes except Sewage and Low Level Radio Active wastes (tonnes)

Waste Management	2017			2020			2036		
CAPACITY GAP No Growth	**Scenario 1 Baseline**	**Scenario 2 Maximum**	**Scenario 3 Minimum**	**Scenario 1 Baseline**	**Scenario 2 Maximum**	**Scenario 3 Minimum**	**Scenario 1 Baseline**	**Scenario 2 Maximum**	**Scenario 3 Minimum**
Composting (Secondary LACW)	25,649	27,776	27,776	25,649	30,967	30,967	25,649	30,967	30,967
EfW (C&I)	2,808	21,465	11,575	2,808	49,452	24,726	2,808	49,452	24,726
EfW (Haz)	853	853	853	853	853	853	853	853	853
EfW (LACW Secondary)	93,941	111,725	111,725	93,941	138,401	138,401	93,941	138,401	138,401
Inert Landfill (E)	243,334	+232,678	239,535	+198,971	+172,304	189,448	+557,091	+501,852	530,424
Inert Landfill LACW Secondary)	795	789	789	795	779	779	795	779	779
Non-Haz Landfill (LACW Secondary)	0	0	0	*115,345	0	*35,028	*115,345	0	0
Non-Haz Landfill (LACWHH)	0	0	0	*52,994	0	0	*52,294	0	0
Haz Landfill (Secondary)	0	0	0	0	0	0	++618	++618	++618
Haz Landfill Agr	0	0	0	0	0	0	++338	++338	++338
Haz Landfill (Haz)	0	0	0	0	0	0	++50,437	++50,437	++50,437
Recycling (C&I)	405,614	412,558	403,756	405,614	422,975	400,969	405,614	533,994	511,741
Recycling Haz)	19,413	19,413	19,413	19,413	19,413	19,413	19,413	19,413	19,413
Recycling (LACW Secondary)	44,742	48,439	48,439	44,742	53,984	53,984	44,742	53,984	53,984

+ Inert landfill changes Bromley Farm Inert landfill closes in 2020, Hollins Hey Landfill closes in 2023, Laneside quarry landfill closes in 2025 and the Old Sewerage Works Landfill closes in 2018

*Non-Haz landfill changes Peckfield Landfill closes in 2020, Thornhill Quarry Landfill closes in 2019 & Wellbeck Landfill closes in 2019

++Haz landfill changes as closures of Bradley Park Quarry in 2029 & Thornhill Quarry Landfill in 2019

Table 42 Comparison of the Capacity Gap at year 2017, 2020 and 2036 across the 3 scenarios, assuming MAXIMUM GROWTH for all wastes except Sewage and Low Level Radio Active wastes (tonnes)

Waste Management	2017			2020			2036		
CAPACITY GAP Max GROWTH	Scenario 1 Baseline	Scenario 2 Maximum	Scenario 3 Minimum	Scenario 1 Baseline	Scenario 2 Maximum	Scenario 3 Minimum	Scenario 1 Baseline	Scenario 2 Maximum	Scenario 3 Minimum
Composting (Secondary LACW)	25,963	28,116	28,116	26,394	31,866	31,866	28,351	34,229	34,229
EfW (C&I)	2,846	21,753	11,730	2,893	50,949	25,474	3,232	56,918	28,459
EfW (LACW Secondary)	97,539	115,540	115,540	102,477	148,228	148,228	124,907	174,051	174,051
EfW (Haz)	864	864	864	879	879	879	982	982	982
EfW (LACWHH)	0	0	0	0	0	0	4,899	4,932	4,932
Haz Landfill (agr)	0	0	0	0	0	0	338	338	338
Haz Landfill (Haz,)	0	0	0	0	0	0	58,052	58,052	58,052
Haz Landfill (LACW Secondary)	0	0	0	0	0	0	683	689	689
Inert Landfill (E)	261,416	250,606	257,556	239,789	212,314	229,977	760,624	697,045	729,931
Inert Landfill (LACW Secondary)	805	798	798	818	802	802	879	861	861
MBT (LACWHH)	0	0	0	386	370	370	3,543	3,526	3,526
Non-Haz Landfill (C&I,)	0	0	0	0	0	0	22,872	0	0
Non-Haz Landfill (LACW Secondary)	0	0	0	118,695	0	45,176	127,496	0	0
Non-Haz Landfill (LACWHH)	0	0	0	62,990	0	0	79,903	0	0
Recycling (C&I,)	428,543	435,581	426,660	457,403	435,581	452,618	663,860	860,569	802,870
Recycling (Haz)	20,867	20,867	20,867	22,696	22,696	22,696	35,780	35,780	35,780
Recycling (LACW Secondary)	45,290	49,032	49,032	46,041	55,552	55,552	49,456	59,671	59,671
Recycling CD&E (LACW Secondary)	0	0	0	0	0	0	0	4,398	4,398

Table 43 Comparison of the Capacity Gap at year 2017, 2020 and 2036 across the 3 scenarios, assuming MIMINIMISED GROWTH for all wastes except Sewage and Low Level Radio Active wastes (tonnes)

Waste Management	2017			2020			2036		
CAPACITY GAP MINIMISED GROWTH	**Scenario 1 Baseline**	**Scenario 2 Maximum**	**Scenario 3 Minimum**	**Scenario 1 Baseline**	**Scenario 2 Maximum**	**Scenario 3 Minimum**	**Scenario 1 Baseline**	**Scenario 2 Maximum**	**Scenario 3 Minimum**
Composting (Secondary LACW)	25,806	27,946	27,946	26,019	31,414	31,414	26,970	32,562	32,562
EfW (C&I)	2,827	21,609	11,653	2,850	50,196	25,098	3,004	52,906	26,453
EfW (LACW Secondary)	95,737	113,630	113,630	98,185	143,286	143,286	109,184	155,833	155,833
EfW (Haz)	859	859	859	866	866	866	913	913	913
Haz Landfill (agr,)	0	0	0	0	0	0	338	338	338
Haz Landfill (Haz,)	0	0	0	0	0	0	53,960	53,958	53,958
Haz Landfill (LACW Secondary)	0	0	0	0	0	0	650	656	656
Inert Landfill (E)	252,367	241,629	248,532	219,260	192,192	209,593	651,248	592,151	622,718
Inert Landfill (LACW Secondary)	800	794	794	806	791	791	836	820	820
MBT (LACWHH)	0	0	0	0	0	0	1,316	1,300	1,300
Non-Haz Landfill (LACW Secondary)	0	0	0	117,010	0	0	121,287	0	0
Non-Haz Landfill (LACWHH)	0	0	0	57,611	0	0	75,848	0	0
Recycling (C&I)	417,061	424,052	415,191	431,356	448,979	426,642	525,081	662,429	638,621
Recycling (Haz)	20,139	20,139	20,139	21,045	21,045	21,045	26,985	26,985	26,985
Recycling (LACW Secondary)	45,015	48,735	48,735	45,388	54,763	54,763	47,047	56,765	56,765

Table 44 Comparison of the EXCESS Capacity at year 2017, 2020 and 2036 across the 3 scenarios, assuming NO GROWTH for all wastes except Sewage and Low Level Radio Active wastes (tonnes)

Waste Management	2017			2020			2036		
EXCESS CAPACITY GAP NO GROWTH	Scenario 1 Baseline	Scenario 2 Maximum	Scenario 3 Minimum	Scenario 1 Baseline	Scenario 2 Maximum	Scenario 3 Minimum	Scenario 1 Baseline	Scenario 2 Maximum	Scenario 3 Minimum
Composting LACWHH/LACWNHH	24,592	22,259	22,259	24,592	19,533	19,533	24,592	19,533	19,533
EfW LACWHH	8,149	8,137	8,137	8,149	8,119	8,119	8,149	8,119	8,119
Haz Landfill	206,527	206,524	206,524	206,527	206,521	206,521	0	0	0
Haz & Non-Haz Landfill	522,973	76,297	76,297	0	0	0	0	0	0
Treatment	238,857	238,857	238,857	238,857	238,857	238,857	238,857	238,857	238,857
Haz & Treatment	156,208	155,377	156,465	156,208	154,131	156,851	156,208	141,521	143,993
Incineration no energy recovery (Haz)	4149	4149	4149	4149	4149	4149	4149	4149	4149
MBT LACWHH	816	822	822	816	831	831	816	831	831
Non-Haz Landfill C&I, LACW ALL)	522,973	595,799	576,018	0	14,424	0	0	138,053	88,601
LACW Secondary RDF/Autoclave	567,171	567,180	567,180	567,171	567,194	567,194	567,171	567,194	567,194
Recycling Metals	403,148	395,138	395,138	403,148	366,340	366,340	403,148	356,840	356,840
LACWHH/NHH Recycling	119,624	103,422	103,422	119624	79,119	79,119	119624	79,119	79,119
LACWHH Residual MRF	447,083	457,903	457,903	447,083	474,133	474,133	447,083	474,133	474,133
Recycling CD&E	120,204	109,543	116,401	120,204	93,552	110,696	120,204	64,980	93,552

Table 45 Comparison of the EXCESS Capacity at year 2017, 2020 and 2036 across the 3 scenarios, assuming Maximised GROWTH for all wastes except Sewage and Low Level Radio Active wastes (tonnes)

Waste Management	2017			2020			2036		
EXCESS CAPACITY GAP MAXIMUM GROWTH	Scenario 1 Baseline	Scenario 2 Maximum	Scenario 3 Minimum	Scenario 1 Baseline	Scenario 2 Maximum	Scenario 3 Minimum	Scenario 1 Baseline	Scenario 2 Maximum	Scenario 3 Minimum
Composting LACWHH/LACWNHH	23,181	22,259	22,259	22,259	15,503	15,503	22,259	4,913	4,913
EfW LACWHH	6,633	6,621	6,621	4,552	4,521	4,521	0	0	0
Haz Landfill	205,843	205,841	205,841	204,981	204,976	204,976	0	0	0
Haz & Non-Haz Landfill	76,297	76,297	76,297	0	0	0	0	0	0
Haz & Treatment	152,995	152,153	153,256	148,952	146,812	149,614	120,024	103,120	105,965
Treatment	238,857	238,857	238,857	238,857	238,857	238,857	238,857	238,857	238,857
Incineration no energy recovery (Haz)	4,071	4,071	4,071	3,972	3972	3972	3,266	3,266	3,266
MBT LACWHH	309	315	315	0	0	0	0	0	0
Non-Haz Landfill C&I, LACW ALL)	516,871	590,628	570,582	0	5,772	5,772	0	117,196	60,278
LACW Secondary RDF/Autoclave	567,136	567,146	567,146	567,089	567,113	567,113	566,873	566,899	566,899
Recycling Metals	399,409	391,291	391,291	377,920	357,289	357,289	334,755	311,707	311,707
LACWHH/NHH Recycling	117,118	100,718	100,718	113,678	71,997	71,997	98,056	53,284	53,284
LACWHH Residual MRF	442,555	453,507	453,507	436,338	464,174	464,174	408,105	438,005	438,005
Recycling CD&E	110,336	99,532	106,481	97,865	70,406	88,669	10,219	0	0

Table 46 Comparison of the EXCESS Capacity at year 2017, 2020 and 2036 across the 3 scenarios, assuming MEDIAN GROWTH for all wastes except Sewage and Low Level Radio Active wastes (tonnes)

Waste Management	2017			2020			2036		
EXCESS CAPACITY GAP MEDIAN GROWTH	Scenario 1 Baseline	Scenario 2 Maximum	Scenario 3 Minimum	Scenario 1 Baseline	Scenario 2 Maximum	Scenario 3 Minimum	Scenario 1 Baseline	Scenario 2 Maximum	Scenario 3 Minimum
Composting LACWHH/LACWNHH	23,887	22,259	22,259	22,928	17,530	17,530	22,259	12,384	12,384
EfW LACWHH	7,392	7,380	7,380	6,361	6,330	6,330	1,769	1,737	1,737
Haz Landfill	206,185	206,183	206,183	205,759	205,753	205,753	0	0	0
Haz & Non-Haz Landfill	0	76,297	76,297	0	0	0	0	0	0
Haz & Treatment	154,604	153,768	154,863	152,601	150,493	153,253	139,469	123,756	126,401
Treatment	238,857	238,857	238,857	238,857	238,857	238,857	238,857	238,857	238,857
Incineration no energy recovery (Haz)	4,110	4,110	4,110	4,061	4,061	4,061	3,740	3,740	3,740
MBT LACWHH	563	569	569	218	234	234	0	0	0
Non-Haz Landfill C&I, LACW ALL)	519,927	593,217	573,304	0	10,123	0	0	128,149	75,244
LACW Secondary RDF/Autoclave	567,154	567,163	567,163	567,130	567,154	567,154	567,025	567,050	567,050
Recycling Metals	401,281	393,217	393,217	382,167	361,841	361,841	357,384	335,961	335,961
LACWHH/NHH Recycling	118,373	102,072	102,072	116,668	75,578	75,578	109,077	66,485	66,485
LACWHH Residual MRF	444,822	455,708	455,708	441,741	469,182	469,182	428,023	456,467	456,467
Recycling CD&E	115,277	104,545	111,448	109,100	82,047	99,449	69,224	10,143	40,711

12 Results Future Capacity Requirements

This section of the report deals with each of the principal waste streams in turn, setting out:

- Current arisings and capacity of existing facilities;
- Future Arisings; and
- Capacity requirements

A summary of the findings of the modelling process are discussed below and presented in detail in **Appendix 2** (all 18 Tables showing each growth scenario and each behavioural scenario for both capacity gap and any excess capacity for 2017 to 2036).

12.1 Local Authority Collected Waste (LACW)

12.1.1 Current Arisings and Capacity of Existing Facilities

A total of 1,447,063 tonnes of LACW was produced in 2015/16 in West Yorkshire discounting commercial trade waste collections/hazardous LACW and inert CD&E that would otherwise be counted under the other main waste steams).

The authorities within West Yorkshire rely on a mixture of waste management options including; local merchant facilities which uses mechanical and hand sorting to extract recyclates or mechanical biological treatment with resulting RDF subsequently exported for energy recovery/used locally, EfW for the primary disposal of residual waste, mixed recyclables managed in dedicated materials recycling facilities, some materials that require more specialised recycling (e.g. batteries) are taken to other reprocessing sites which serve several regions and which are located outside WYCA.

There are five main green waste composting sites within West Yorkshire (one purpose built under a PFI contract). There is sufficient capacity at these sites for LACW green waste composting (although it is known that at 2015/16 some green waste was being exported out of the sub-region to North Yorkshire); therefore no primary green waste composting sites are envisaged being required to meet this need.

LACW materials sent for recycling are managed through a wide variety of outlets. West Yorkshire has sufficient facilities for transfer of recyclable materials and facilities for the processing of primary recycling. Although some specialist recycling such as for batteries takes place outside the sub-region.

12.1.2 Future Arisings

The modelling reflects growth forecasts for LACW in proportion to population growth. There are some interim arrangements for the management of Residual waste treatment capacity within WYCA with export and management outside of WYCA taking place for the use and treatment of RDF.

12.1.3 LACW Required Facilities: composting secondary LACW

There is a surplus of capacity under all scenarios for LACWHH AND LACWNHH for composting across the plan period in the order of 23,181 tonnes (maximum growth/baseline) reducing down to 4,913 tonnes by 2036 (maximised growth/maximised recycling). There is however a shortfall for the composting of secondary LACW organic material8 which is currently (2016) being sent to North

[8] Compost like products of waste treatment are likely to fall short of meeting approved specifications for compost that can be used as a general growing medium.

Yorkshire. This is in the order of 25,649 tonnes (no growth/baseline 2017) and 28,116 tonnes (maximum growth/maximum recycling) in 2017 increasing to a capacity gap of 34,229 tonnes (2036; maximum growth/maximum recycling).

12.1.4 LACW Required Facilities: Recycling secondary LACW

There are extensive bulking up/sorting facilities at multiple waste transfer facilities across WYCA and substantial other primary waste recycling facilities. There will be a need for more specialist recycling facilities currently not located within West Yorkshire such as battery recycling and other hazardous waste materials. The LACW Secondary waste capacity gap for recycling is at 44,742 tonnes for the plan period (no growth/baseline), hazardous recycling (which includes some LACWHH and LACWNHH) is identified as a capacity gap of 19,413 tonnes for the whole plan period (no growth/baseline).

There is also an identified capacity gap for the management of LACW Secondary waste for recycling CD&E materials at 4,398 tonnes (2036) which appears only towards the end of the plan period (maximum growth), this is the dry recyclate produced from secondary reprocessing of residual waste.

12.1.5 LACW Required Facilities: Residual Mechanical/Biological Treatment Facilities (MBT)

Across WY as the scenario for maximum growth/maximum recycling is applied there is a small capacity gap appearing from 2019 (152 tonnes), this increases to 3,526 tonnes by 2036 under the maximum growth/maximum recycling scenario for MBT capacity requirement. At present there is only one MBT facility within West Yorkshire.

12.1.6 LACW Required Facilities: Landfill

There is an identified need for a small tonnage of inert landfill associated with secondary waste management within WY; under baseline/no growth this is in the order of 795 tonnes for the plan period starting in 2017 rising to 879 tonnes by 2036 baseline/maximum growth. With the scenario for maximum recycling/maximum growth this reduces to 861 tonnes by 2036.

There is a larger capacity gap for non-hazardous landfill commencing in 2020 (when some of the existing landfill sites in WY are due to close). This covers all LACW wastes (household, non-household and secondary LACW) under no growth/baseline at 2020 this is 52,294 tonnes (HH/NHH) and in the order of 115,345 tonnes for LACW Secondary until 2036. Under the scenario maximum growth with baseline this rises to 62,990 tonnes (HH/NHH) and 118,695 tonnes at 2020 to 79,903 tonnes and 127,496 tonnes at 2036. However, with maximum recycling/maximum growth scenario this reduces so that there is no capacity gap for LACWHH/NHH or LACW Secondary at all for the whole plan period. However, with maximum growth/minimum recycling there is a capacity gap for LACW Secondary from 2020 to 2027 (in the order of 45,176 tonnes in 2020 reducing down to 4,002 tonnes by 2027).

There is a very small gap for hazardous landfill for LACW Secondary wastes (fly ash) only appearing at 2029 at 618 tonnes (baseline/no growth) rising to 683 tonnes by 2036 applying maximum growth to baseline. This capacity gap appears under all scenarios from 2029 reflecting the difficulty of recycling or treating such fly ash materials that it is envisaged will continue to require landfill for the whole plan period.

12.1.7 LACW Required Facilities: Energy Recovery

There is a very small capacity gap for the primary treatment of LACWHH by EfW appearing in 2028 with maximum growth/minimum recycling in the order of 604 tonnes (2028) rising to 4,932 tonnes by 2036. This does not appear at all under the scenario baseline/no growth for the whole plan period.

The main capacity gap is for the treatment of the secondary products (some LACW collected in WY currently undergoes mechanical/biological treatment that produces a secondary product called RDF which remains a waste even though it has been processed). The forecasting model identifies that there is a need for EfW capacity in WY to use this RDF as a fuel.

There are four sites with planning permission (see Table 38) which could help to meet the need for this element of LACW requirement. If all the facilities become operational, they will provide sufficient capacity to meet the identified need for LACW and C&I. Should these facilities not come forward then WY will need to consider how to meet the identified gap throughout the plan period.

The forecasting model identifies a gap across the whole plan period for this secondary LACW RDF material, in 2017 (no growth/baseline) at 93,941 tonnes and at 115,540 maximum growth/maximum recycling at 2017 rising to 174,051 tonnes by 2036.

12.1.8 Excess capacity LACW

WY has excess capacity throughout the plan period for waste transfer facilities, waste recycling, composting (LACWHH/NHH) and residual material recycling facilities for the processing of LACW. Under maximum growth/maximum recycling (Scenario2) there is still an excess of capacity for LACW recycling and residual MRF facilities across WY. This is in the order of 554,225 combined capacity at 2017 and reducing down to 491,289 tonnes by 2036. However, recycling facilities will usually only represent one step in a chain of separating, sorting and ultimately reprocessing and the capacity indicated in the model only represents the first step in the chain, such that onward reprocessing capacity will be usually required for separated recyclates.

Table 47 Excess capacity for LACW Waste Management Facilities under the scenario maximum growth/maximum recycling (tonnes)

Excess Capacity Maximum Growth/Maximum Recycling (scenario 2)	2017	2020	2036
Composting LACWHH/NHH	22,259	15,503	4,913
Recycling LACWHH/NHH	100,718	71,997	53,284
Residual MRF	453,507	464,174	438,005
MBT	315	0	0
EfW LACW	6,621	4,521	0
LACW Secondary RDF/Autoclave	567,146	567,113	566,899
Non-Haz Landfill **(Excess included C&I WASTES)**	590,628	5,772	117,196

Another waste management types in excess for the whole plan period is that of LACW Secondary RDF/MBT/Autoclave or similar provided by Ferrybridge multi-fuel power station which in theory could provide a capacity at 570,000 tonnes (whole facility) and at present is only 7% capacity is utilised for secondary waste management.

12.2 Commercial and Industrial (C&I) Waste

12.2.1 Current Arisings and Existing Facilities

C&I data estimates have been based on 2,472,581 tonnes (EA Interrogator 2015) see earlier section of this report.

Recycling potential, particularly for commercial and industrial waste, is increasing, with the greatest opportunity for mixed waste which offers some potential for source segregation. The baseline position in 2015 (extrapolated to 2017 for modelling purposes) is already at a high position for recycling and treatment at Baseline recycling based on 80% Commercial and Industrial with 8% treatment, less than 1% recovery, and the remainder 11% to landfill.

12.2.2 Future Arisings Scenarios and Subsequent Capacity Gap

C&I Required Facilities: Transfer Stations

Waste transfer stations and bulking facilities provide a valuable component in the efficient management of waste materials. In particular they are useful when waste arisings are relatively small in quantity and widely distributed. For this reason transfer stations are seen to be a significant feature of waste management provision within the WY area.

There is extensive capacity for the transfer and bulking of commercial and industrial waste, with capacity providing 835,000 tonnes throughout the plan period for the sorting and screening of waste materials. These facilities perform an important role in the WY area but further capacity may be required to provide suitable geographical distribution. It is not possible to assess whether there is capacity excess as these facilities perform an interim management of waste and are not the final destination for waste management, sometimes passing through multiple waste transfer facilities before final management. The modelling undertaken does not map waste transfer usage and therefore this is not shown in the tables at the end of this report as a requirement during the Plan period. In the model, capacity is allocated to recycling, treatment or disposal options. It should however be noted that due to the important role of transfer station facilities in the WY area, further capacity may be required to provide suitable geographical distribution.

C&I Required Facilities: Recycling Facilities

There is a capacity gap for recycling waste management facilities under every growth /behavioural scenario combination across the whole plan period of a least over 400,000 tonnes to recycle C&I waste materials within the WY area. The gap is indicated to be in the order of 405,614 tonnes (2020, no growth/baseline position) rising to the order of 457,403 tonnes (2020 maximum growth/maximum recycling) and by the end of the plan period (2036) this capacity gap has risen to 860,569 tonnes (under the maximised recycling and growth scenario). Whilst a proportion of recyclate is currently managed through transfer and bulking facilities within the WY area, final destination recycling and reprocessing facilities lie mainly outside of the WY area and therefore current provision is met predominantly by export. However, it is understood that transfer facilities also undertake an amount of recycling such as sorting, segregation and bulking of recyclate (c. 35%). This has been taken into account in the projected capacity gap for recycling facilities where the information from the WDI indicates that transfer facilities have recorded material removed from their sites as recyclate. As with the comment in 12.2.2 above such capacity only represents the first step in the chain, such that onward reprocessing capacity will be usually required for separated recyclates.

It is It is likely that increase national recycling provision for bulk recyclate materials such as paper and card, glass and plastics may be met by increased capacity at regionally and nationally significant facilities through economies of scale and not necessarily at the sub-regional WY level.. . The Department of Communities and Local Government discusses self sufficiency and proximity principle and suggests that whilst it may be uneconomic for each local planning authority to process some wastes in small quantities it could achieve significant economies of scale for local authorities working together to assist with the development of a network of waste management facilities to enable waste to be handled effectively[9]. Therefore this should not prevent applications coming forward for recycling of these wastes and it may seem prudent to plan for a sub-regional facilities rather than rely on regional capacity and so the required number of facilities/land take are indicated in Tables 54-56 to address this. In addition in the absence of new capacity it is recommended that WYCA make contact with neighbouring/other Waste Planning Authorities in order to establish whether they are aware of any foreseeable change which may affect the position over the expected time period of the capacity study.

C&I Required Facilities: Energy from Waste

There is a capacity gap for EfW facilities for the whole plan period for every scenario combination starting at no growth/baseline in 2017 at just over 2,000 tonnes (2,808 tonnes) rising to 25,659 (at 2036 no growth/baseline). Under maximum growth/maximum recycling/recovery (scenario 2) this rises from 21,753 tonnes in 2017 to 56,918 tonnes by 2036.

The introduction of four energy recovery facilities with extant planning permission[10] would meet this need (when also considering the management of LACW for energy from waste processing. Scenario 2 produces the greatest demand for energy recovery facilities). If these four energy recovery facilities are not commissioned then the gap in energy recovery requirement would be the biggest of 56,918 tonnes by the end of the plan period (2036) under Scenario 2 (assuming growth).

C&I Required Facilities: Non-Hazardous Landfill

A number of non-hazardous landfill sites close over the plan period within WY plan area including Wellbeck Landfill, Thornhill Quarry Landfill and Peckfield Landfill in 2020. The capacity gap for landfill of commercial and industrial waste within WY area commences under the maximum growth scenario/baseline scenario in 2025 with a gap of 818 tonnes but this rises at the end of the plan period, 2036 to 22,872 tonnes. This gap does not appear however under the other two behavioural scenarios (maximum and median recycling) as waste is diverted away from landfill under these options.

12.2.3 Excess Capacity C&I

Excess capacity for the waste management of commercial and industrial waste materials is available over the whole plan period for ; metals recycling (specialist recycling; End of Life Vehicles, Metals and Waste Electronic and Electrical Equipment [WEEE]), some types of treatment and non-hazardous landfill (except under maximum growth/baseline from 2025 to 2036).

[9] Department of Communities and Local Government ,reference id 28-007-20141016 (revision date 16/10/2014

[10] Biogen/Energos (gasification) Ripley Road plant (160,000 tonnes per annum) and Land East of Former Gas Works, Airedale Road, Keighley (140,000 tonnes per annum) Skelton Grange, Leeds (300,000 tonnes) Belmont Industrial Estate, Calderdale (10,000 tonnes per annum)

Modelling shows a surplus capacity under all growth projections and scenarios throughout the Plan period therefore no additional ELV, Metals and WEEE processing sites are likely to be required during the Plan period.

Treatment includes a wide range of processes that may be required to deal with specialist materials prior and post to recycling, energy recovery and prior to final disposal. C&I waste requiring treatment also includes hazardous waste. Table 48 shows excess capacity for C&I Waste Management Facilities under the scenario maximum growth/maximum recycling (tonnes).

Table 48 Excess capacity for C&I Waste Management Facilities under the scenario maximum growth/maximum recycling (tonnes)

Excess Capacity Maximum Growth/Maximum Recycling (scenario 2)	2017	2020	2036
Recycling Metals	391,291	357,289	311,707
Treatment (including Hazardous Treatment)	391,011	385,669	341,977
Non-Hazardous Landfill (includes capacity for LACWHH/NHH & Secondary)	590,628	5,772	117,196

12.3 Construction Demolition and Excavation (CD & E) Waste

12.3.1 Current Arisings and Existing Facilities

C&D data estimates have been based on 571,447 tonnes and Excavation wastes at 1,480,248 tonnes (see earlier section of this report. EA Interrogator 2015).

There is no available data covering "Registered Exemptions" for CD&E which would include registered exempted composting sites, burning practices on land, spreading on land for reclamation/improvement and or sites used for the storage of CD&E materials and mobile recycling of C&D. It is likely that the level of arisings managed through exempt operations will continue into the future and thus arisings will not require additional future planned capacity.

12.3.2 Future Arisings and Subsequent Capacity Gap

CD&E Required Facilities: Transfer Stations

Waste transfer stations and bulking facilities often provide a valuable component in the transfer and bulking of CD&E waste materials. Modelling under all scenarios and growth factors shows no gaps in provision over the whole Plan period.

CD&E Required Facilities: Recycling CD&E

There is excess capacity availability for the recycling of CD&E waste materials under all scenarios until 2028. Under maximum growth/maximum recycling there is a capacity gap in 2029 of 1,695 tonnes rising to 4,398 tonnes by 2036. The excess capacity baseline/no growth is at 120,204 tonnes annually, by 2020 this has diminished to 99,449 tonnes (minimum growth/median recycling) and down to zero by 2029 (maximum growth/maximum recycling).

CD&E is also currently recycled / treated on site through mobile machinery. These operations are permitted by local authorities and data on waste types and throughput are not recorded in the EA Interrogator database and thus no quantitative data is available. These operations are likely to remain an important methodology for C&D recycling.

Recycling of CD&E waste is economically more viable at more localised facilities due to the lower value and costs of transporting lower value higher density wastes and therefore the recycling

facilities for this waste stream may (even through showing no shortfall within the modelling) be required within the Plan Area. CD&E recycling can be achieved by mobile plant working at demolitions sites as well as at fixed facilities. Developments which produce a high level of CD&E are encouraged to recycle this material on site using mobile plant and it is expected that WYCA will continue to encourage such practices to move the management of this waste up the hierarchy.

CD&E Required Facilities: Inert Landfill

There is a capacity gap for the landfill of excavation materials under every scenario (from baseline/no growth, baseline/maximum recycling to maximum growth/maximum recycling for the whole plan period). Under the Baseline scenario with no growth the initial gap of 243,334 tonnes in 2017 rises to 557,091 tonnes per annum at 2036 with growth. This is because several inert landfill sites close across the WY area; the Old Sewerage Works Landfill closes in 2018, Bromley Farm Landfill closes in 202, Hollins Hey Landfill in 2023, and Nostrell Quarry Landfill and Laneside Quarry Landfills closes in 2025.

Under maximised recycling with growth the gap for excavation wastes has risen to 250,606 tonnes in 2017, 212,314 tonnes by 2020 (due to the increase in recycling) and by 2036 is at 697,045 tonnes. Under maximum growth/median recycling the gap is 257,556 tonnes in 2017, 229,977 tonnes by 2020 and 629,931 tonnes by 2036.

However, there are a few potential landfill sites that are either inactive, require quarrying before the production of void space or at only the safeguarding stage across WY. These include Moor Top Quarry (Leeds WPA which may provide 340,000 cubic metres of void space in the future, Odda Quarry (Leeds WPA over 400,000 cubic metres void potentially once quarried), Rudd Quarry (Wakefield WPA) and Swillington Quarry Landfill (Leeds WPA over 4 million tonnes of void once quarrying taken place).

- Whilst it is desirable to close the gap for excavation materials by diverting this waste to recycling as indicated by the waste hierarchy guidance, this is often not practical due to the nature of excavated materials such as clay soils and stones. However, inert landfill may often serves as an important way of restoring mineral working and brown field sites. Excavation waste is also an important requirement for both operating non-hazardous and hazardous landfill sites and in their subsequent restoration. It is not possible to quantify the extent to which exempt sites such as construction projects utilise excavation waste but these are likely to continue to accept a significant portion of the apparent gap in landfill provision for inert excavation waste. Never the less additional inert landfill capacity may well be required either from new developments or utilising the sites identified in paragraph above. It may also be necessary to investigate further the potential for an additional site , extension of an existing facility or bringing forward capacity within quarrying/restoration operations to help ease capacity shortfalls.

Excess Capacity for CD&E Wastes

There is an excess capacity for the recycling of CD&E waste materials, except under the scenario maximum growth/ maximum recycling in 2029 to 2036. Excess capacity is shown in Table 49.

Table 49 Excess capacity for CD&E Waste Management Facilities under the scenario baseline/no growth and maximum growth/maximum recycling (tonnes)

	2017	2020	2036
Baseline/No Growth (Scenario 1) Inert Landfill	120,204	120,204	120,204
Maximum GROWTH/ Maximum Recycling Inert Landfill (scenario 2)	99,532	70,406	0
Minimised Growth/Median Recycling (Scenario 3)	111,448	99,449	40,711

12.4 Hazardous Waste

12.4.1 Current Arisings and Existing Facilities

A total of 208,731 tonnes of hazardous waste was recorded as arising in the WY area extrapolated for 2017.

12.4.2 Future Arisings Scenarios and Subsequent Capacity Gap

The future capacity requirement for hazardous waste has already been taken into account under the main classes of waste materials for which hazardous waste is a sub-set. However there are some capacity gaps within the WY area for the specialist management of hazardous waste; hazardous waste facilities for recycling and landfill. There are no capacity gaps for some of the specialist types of treatment of hazardous wastes across the plan period.

The capacity gaps are for specialist hazardous landfill and hazardous recycling. The capacity gap for hazardous landfill does not occur until 2036 assuming no growth and baseline position as this coincides with the closure of Bradley Park Quarry in 2029 and also the limited life of Thornhill Quarry Landfill (some cells can accept hazardous materials) which closes in 2020. Capacity gaps are shown in the Table 50 below. There is a capacity gap for recycling facilities for hazardous materials over the plan period from baseline/no growth at 2017 of 19,413 tonnes increasing to 20,867 in 2017 for maximum growth/maximum recycling which increases to 35,780 by 2036.

Table 50 Capacity gap for Hazardous waste Management Facilities under the scenario baseline/no growth and maximum growth/maximum recycling (tonnes)

Capacity Gap	2017	2020	2036
Baseline/No Growth (Scenario 1) hazardous Landfill	0	0	50,437
Baseline/No Growth (Scenario 1) Hazardous Recycling	19,413	19,413	19,413
Maximum GROWTH/ Maximum Recycling hazardous Landfill (Scenario 2)	0	0	58,052
Maximum GROWTH/ Maximum Recycling Hazardous Recycling (Scenario 2)	20,867	22,696	35,780

It should be noted that hazardous waste facilities require economies of scale. Any new provision of facilities within the Plan area for the small quantities of arisings would be unlikely to be viable unless such new facilities were also to import additional quantities of hazardous waste from outside the Plan area. The closure of the Hazardous Landfill site near the end of the plan period 2029 and earlier closure in 2020 losing some cell provision that can accept hazardous waste does require assessment as to whether there is any other solution for Hazardous landfill outside the plan area or whether a new site needs to be identified in the WY area.

12.4.3 Excess Capacity for Hazardous Waste

There is some excess capacity for hazardous waste for landfill and specialised treatment for most of the plan period, until 2029 (when a landfill site closes in the WY area). Excess capacity is shown in Table 51.

Table 51 Excess capacity for Hazardous Waste Management Facilities under the scenario baseline/no growth and maximum growth/maximum recycling (tonnes)

Capacity Gap	2017	2020	2036
Baseline/No Growth (Scenario 1) Hazardous &Treatment*	238,857	238,857	238,857
Baseline/No Growth (Scenario 1) Hazardous Landfill	206,527	206,527	0
Maximum GROWTH/ Maximum Recycling (Scenario 2) Hazardous &Treatment*	152,153	146,812	103,120
Maximum GROWTH/ Maximum Recycling Hazardous Landfill (scenario 2)	205,841	204,976	0

*The excess treatment figures do however also include treatment for non-hazardous commercial and industrial waste as well as hazardous wastes.

Due to the occurrence of capacity for the treatment of hazardous materials at present within the WY area some 302,069 tonnes are seen to be imported into WY (see earlier section of the report Table 16) with 132,555 tonnes exported in 2015 (Table 17) in 2015. The WY area is therefore a net importer of hazardous waste. The movement of hazardous waste reflects the management of these specialised wastes at regionally or nationally significant facilities.

12.5 Sewage Sludge and Waste Water Treatment

12.5.1 Current Arisings and Existing Facilities

According to data from the EA's Waste Data Interrogator, in 2015 there were nine Yorkshire Water sites in West Yorkshire treating sewage sludge. In 2015 this amounted to 375,000 tonnes.

12.5.2 Future Arisings and Subsequent Capacity Gap

Yorkshire Water was contacted in order to gain a broad overview of their future capacity requirements as far into the future as possible. Yorkshire Water has produced Asset Management Plans (AMP) to assess the future requirements for managing waste water and sewage sludge within West Yorkshire. The most recent of these (AMP-6) was completed at the end of 2014 and covers infrastructure requirements over the period 2015-2020. The next plan, for 2020-2025 is currently under development.

There is one major development taking place, which is the construction of a new 50,000 tpa sludge treatment and anaerobic digestion facility at the Knostrop site, due for completion in 2019. However, this will occur within the current site boundary so no further land will be needed. However, Yorkshire Water have been involved in consultations on Local Plans in the area and will continue this role going forward, which would help inform any changes in growth requirements. Yorkshire Water does not anticipate building any new WWTW in the WY area up to 2025.

12.5.3 Required Facilities

As a general principle, when greater capacity is required, WWTW operators would try and place new plant on existing treatment works, or failing that purchase land from an adjacent land owner. Therefore it is unlikely that new sites will be required within the Plan area to handle waste water/sewage sludge, particularly in view of the significant size of the existing Yorkshire Water landholdings in West Yorkshire at current sites.

At present it is not envisaged that sites or capacity should be identified within the WY area for future use as WWTW as there is no current requirement for additional facilities. Should any further land be required to support the operation of Yorkshire Water, there is capacity within the existing Esholt site (Bradford WPA) and Knostrop site (Leeds WPA) which could potentially meet that need.

12.6 Agricultural Waste

12.6.1 Current Arisings and Existing Facilities

The WY area generates around 1,083,256 tonnes of agricultural waste, the majority of which is managed within the generating farm holding (see Table 22). A total of 10,261 tonnes of agricultural waste (leaving the farm holdings) has been used for modelling purposes.

12.6.2 Future Arisings and Subsequent Capacity Gap

It will be necessary to provide for waste leaving the farm holdings amounting to approximately just over 10,200 tonnes per annum (assuming no growth in the volume of agricultural waste arisings). It is likely that in the future more waste may be diverted from landfill for recycling, fulfilling the aspirations of waste management moving up the waste hierarchy.

It is likely that the majority of agricultural waste will still be managed within the farm holdings via land treatment/spreading and composting despite agricultural exemptions currently being implemented (see **Appendix 3**).

12.6.3 Required Facilities

The future arisings are very small (in the order of 10,200 tonnes per annum assuming no growth in agricultural activity or significant change in agricultural practice) and any required facilities to cover off farm holding recycling and hazardous landfill would, in practice, be likely to require additional waste materials to make any new facility viable. The capacity allowance should be noted for the specialised treatment requirements for certain types of agricultural waste such as animal by-products incineration and hazardous landfill. The figures reflect the optimum level of treatment according to the waste hierarchy and in reality some of the waste may not be able to be practically or cost effectively recycled and therefore require treatment by other methods such as landfill.

There is no immediate need to provide any new facilities solely to cover agricultural wastes. However, there is a small capacity gap (under no growth/baseline) near the end of the plan period by 2029 of 338 tonnes (due to the closure of a landfill site in WYCA Plan area). In the main the small capacity requirements for agricultural wastes recycling are combined with facilities that can recycle C&I wastes (and LACW wastes). The “specialised” wastes generated that require specialist treatment are likely to continue to be treated at such existing specialised facilities over the plan period. It is noted that there are specialist storage plants, processing (rendering) plants, incineration, co-incineration plants and combustion plants all licensed and registered specifically for animal by-products treatment only located already in WY (such as the Incineration plants at Keighley and Bradford (operated by G and A Fort and Mitchell by-products Ltd), and rendering/processing plants operated by Omega Proteins Ltd and P Waddington and company). The rendering facilities are

specialised facilities of which there are a very limited number across the UK (less than 10) and WY is a net importer of animal by-products.

12.7 Low Level Radioactive Waste

Most (98%) of Low Level Waste (LLW) in the UK arises from the operation of nuclear power stations, nuclear fuel reprocessing facilities and also from the decommissioning and clean-up of nuclear sites. The remaining 2% is produced by the non-nuclear industry users of radioactivity. As no nuclear sites are located in the plan area, these non-nuclear industries are the sole producers of LLW that will need to be planned for. Therefore, when compared to the total LLW produced in the UK, the amount produced in WY area is very small.

12.7.1 Current Arisings and Existing Facilities

Data from the EA indicates that in West Yorkshire there are 15 sites permitted to dispose of LLRW and 14 of these produced LLRW in 2015 (see earlier section of the report). The information provided by the EA indicates that LLRW permits held by sites in West Yorkshire covers all forms of LLRW i.e. solids, liquids and gases. All solid LLRW are permitted for incineration at SRCL's Knostrop incinerator, in all but one case liquid LLRW are permitted for treatment at Yorkshire Water's Knostrop site, and gaseous LLRW are permitted to be disposed of to air on the sites at which they originated.

The information received indicates that levels of LLW produced in WYCA Plan area are minimal. Volumes of waste are not requested from producers of LLW, however an estimate has been made that the annual arising of LLW in the Sub-Region is likely not to exceed 100m3.

12.7.2 Future Arisings and Subsequent Capacity Gap

It is considered unlikely that new facilities generating these materials will emerge locally and there are no known plans to develop nuclear infrastructure that would provide an alternative source. As a result the pattern of use and disposal is not expected to change during the Plan period

12.7.3 Required Facilities

There are no landfill sites in the WY area that can process LLRA wastes. The nearest landfill to WY able to accept LLW is Clifton Marsh in the county of Lancashire, which is permitted until 2035. The latest planning permission relating to Clifton Marsh (Ref: LCC/2014/0162) restricts the amount of LLW originating from outside the North West Region and imported into the site to not more than 4,000 tonnes per annum.

Two treatment facilities exist within the WY area (Leeds WPA) to manage LLW, at the Knostrop treatment works , the two sites are in close proximity at the Knostrop treatment works, one taking aqueous LLRW of up to 109,500tpa and the other taking primarily healthcare waste to a incineration facility with a capacity of 17,000tpa.

There is sufficient capacity to manage any LLW locally through these facilities and it is not anticipated that any new facilities will be required over the plan period for the treatment of LLR. It is considered unlikely that new facilities generating these materials will emerge locally and there are no known plans to develop nuclear infrastructure that would provide an alternative source. As a result the pattern of use and disposal is not expected to change during the Plan period

13 Summary of Future Waste Management Requirements

According to the Needs Assessment, the indicative requirements for future waste management facilities in the WY area can be summarised as follows:

13.1 Future Capacity Requirements for LACW

- There is surplus capacity for composting for LACWHH and NHH throughout the plan period under all Scenarios assuming all available capacity can be utilised by WYCA. However there is a capacity gap for the processing of secondary LACW organic outputs initially around 28,000 tonnes in 2017 rising to 34,229 tonnes (maximum growth/maximum recycling).
- There are extensive bulking up/sorting at multiple waste transfer facilities across WY along with other substantial primary waste recycling facilities. There is a need for more specialist recycling facilities such as battery recycling and for hazardous waste materials. The LACW Secondary capacity gap for recycling is at 44,742 tonnes in 2017 (no growth/baseline) rising to 59,671 tonnes by 2036 (maximum growth/maximum recycling).
- Part of the requirements for LACW is management of residual waste. There are two energy from waste plants active in WY (another three have planning permission but not yet built), plus an MBT plant and there is a plant capable of processing RDF in the plan area (not a specialised waste management plant but used as a power fuel plant at Ferrybridge). Until a contract is in place to treat residual waste to form RDF for one of the authorities within the WY there is a gap for the management of residual waste by EfW of 93,941 tonnes in 2017 (no growth/baseline) rising to 148,228 tonnes by 2020 (when the recycling targets are due at maximum growth/maximum recycling increasing to 174,051 tonnes by 2036 (maximum growth/maximum recycling).
- RDF is currently produced at a site in Bradford and the resulting product is exported from the WY area. Provision of Residual Mechanical Treatment results in secondary products from treating LACW waste. Total EfW requirements, including that for secondary RDF, are 93,941 tonnes per annum under the initial baseline and 174,051 tonnes per annum under median recycling and growth by 2036.
- There are a number of EfW plants within the sub-region that are in the planning process, which specifically require RDF. Should the plan provide for EfW facilities to manage both LACW and C&I, the plan would need to provide for 1 large EfW facility with an annual throughout sufficient to manage up to 35000,000+ tonnes per annum, or up to 2 smaller facilities with an annual throughout of 80-120,000tonnes per annum (to at least cover under baseline levels of recycling/median growth).
- There are a limited number of existing facilities for processing recyclable LACW secondary outputs within WY both organic and inert recyclate materials. Therefore, these materials are currently exported from the WY area. There is an identified gap throughout the Plan period. The scale is in the order of 44,742 tonnes (recycling secondary in 2017 under no growth /baseline rising to 59,671 tonnes by 2036 growth/maximum recycling). Combined with a need for the recycling of C&I waste materials for recycling this could support the requirement for a specialist facility within WY.
- Recycling facilities (e.g. Materials Recycling Facilities (MRF's) and residual materials recycling facilities are in excess for LACW over the whole plan period under every scenario. However, it should be noted that the outputs from recycling facilities can either be a product or a recyclate. If a product is produced from the recycling facility then there is no further

management of waste required as it ceases to be a waste. If recyclate is produced, this material can still be considered a waste requiring further management. The management of the recyclate is currently largely dependent on export from WY. WY should seek to provide facilities for the treatment for recyclate, co-location on allocated recycling facility sites should be considered in the first instance, with sites of sufficient size to accommodate such co-location. It is recognised that some waste transfer stations undertake recycling on site, where it can be identified this is taking place, the modelling work recognises this, and has taken this capacity into account.

- There is an identified need for a small tonnage of inert landfill associated with secondary processing of LACW within WY. This is in the order of a few hundred tonnes 795 tonnes in 2017 (baseline/no growth) rising to 861 tonnes by 2036 under maximum growth/maximum recycling, baseline/growth is 879 tonnes by 2036.
- There is also a larger identified need for non-hazardous landfill for LACWHH/NHH commencing in 2020 (when some of the existing landfill sites in WYCA are due to close) and also for LACW Secondary non-hazardous landfill. Under maximum growth in 2020 baseline situation the capacity gap is 118,695 tonnes for non-hazardous landfill requirement for LACW Secondary and at 127,496 tonnes by 2036 (maximum growth/baseline). With median recycling scenario maximum growth the gap has diminished by 2020 to 45,176 tonnes and to zero by 2036. Non-hazardous landfill for LACWHH/NHH capacity gap appears at 2020 under baseline/maximum growth at 62,990 tonnes rising to 79,903 tonnes baseline/maximum growth by 2036 but with median or maximum recycling scenarios applied there is no gap for the whole plan period.

13.2 Future Waste Capacity Requirements for C&I Waste

- There is extensive capacity for the transfer and bulking of commercial and industrial waste, with capacity providing 835,000 tonnes throughout the plan period for the sorting and screening of waste materials. These facilities perform an important role in the plan area but further capacity may be required to provide suitable geographical distribution. It is not possible to assess whether there is capacity excess as these facilities perform an interim management of waste and are not the final destination for waste management. The modelling undertaken does not map waste transfer usage.
- There is a capacity gap for the recycling of C&I wastes under every growth and every behavioural scenario combination over the whole time period of at least 400,000 tonnes. Whilst a proportion of recyclate is currently managed through transfer and bulking facilities and other recycling facilities within WY, final destination recycling and reprocessing facilities are extensively outside the WY although exact destinations cannot be traced from the available data. At 2020; under no growth/baseline the gap is 405.614 tonnes, under median growth/median recycling the gap is 426,642 tonnes and under maximum growth/maximum recycling 475,290 tonnes. At 2036; under no growth/baseline the gap is 405,614, under median growth/median recycling 638,621 tonnes and under maximum growth/maximum recycling 860,569 tonnes.
- It is possible that increased national recycling provision for bulk recyclate materials such as paper and card, glass and plastics may be met by increased capacity at regionally and nationally significant facilities providing economies of scale. However, this should not prevent applications coming forward for recycling of these wastes and it may seem prudent

to plan for a sub-regional facilities rather than rely on regional or national capacity The Department of Communities and Local Government discusses self sufficiency and proximity principle and suggests that whilst it may be uneconomic for each local planning authority to process some wastes in small quantities it could achieve significant economies of scale for local authorities working together to assist with the development of a network of waste management facilities to enable waste to be handled effectively . The required number of facilities/land take to address the recycling gap are indicated in Table 54-56. In addition in the absence of new capacity it is recommended that WYCA make contact with neighbouring/other Waste Planning Authorities in order to establish whether they are aware of any foreseeable change which may affect the position over the expected time period of the capacity study.

- There is a small capacity gap for the processing of C&I wastes through energy from waste for every scenario combination over the whole plan period but only at just over 2,000 tonnes in 2017 (no growth/baseline) rising to 25,098 tonnes at 2020 (minimised growth/median recycling) and by 2036 rising to 56,918 tonnes (maximum growth/maximum recycling). There is a facility with planning permission within WY for 10,000 tonnes capacity for energy from waste specifically for commercial waste that may be commissioned which would provide some provision (at present the model has assumed this will not become available). The introduction of three other energy from waste facilities with existing permission would exceed this need (all plants together would potentially provide over 600,000 tonnes of capacity), together with providing the additional need for LACW energy from waste processing. However it is not clear if these facilities will be developed (at present the modelling has assumed that they are in abeyance). Should the permissions not come forward, as stated above a single EfW with capacity of 240,000 tonnes per annum would be required to manage both WY's C&I and LACW waste or up to 5 smaller facilities with an annual throughout of approx. 50,000 tonnes per annum over the plan period. However one of the permissions is for 300,000 tonnes which would meet the demand or a combination of the other two plants should be built then this meet WY's requirements for the plan period;
- A number of non-hazardous landfill sites situated within the WY plan area close over the duration of the plan with three sites scheduled to close in 2020. In consequence a capacity gap for management of waste arisings in WY to non-hazardous landfill commences in 2025 but only under the baseline (status quo position) but with maximum growth with a gap of 818 tonnes in 2025 rising to 22,872 tonnes by 2036. If there is a move away from the baseline management of C&I waste then will not be a need to increase landfill capacity, there may be a need to assess reliance on export for waste managed this way, however, later during the plan period.
- There is excess capacity for the management of metals recycling and specialist management for end of life vehicles, and waste electronic and electrical equipment (WEEE). This excess capacity is available under all scenario combinations with all three growth factors. Excess capacity is nearly 400,000 tonnes at the beginning of the plan period decreasing to just over 300,000 tonnes by 2036 (assuming maximum growth and maximum recycling). There is no additional need for ELVs, Metals and WEEE processing sites likely to be required during the plan period.
- Treatment includes a wide range of processes that may be required to process specialist waste materials prior and post to recycling, energy recovery or prior to final disposal. C&I

wastes requiring treatment also includes hazardous wastes (as many of the sites are licensed to treat these waste streams together). There is excess treatment capacity under all scenarios. The excess capacity at maximum growth/maximum recycling in 2017 nearly 400,000 tonnes (391,011 tonnes), 385,669 by 2020 and down to 341,977 by 2036. It would seem unlikely that additional treatment capacity is requirement for the management of C&I waste arisings in the WY area over the plan period. However given the specialist nature and wide variety of such treatment processes (biological, physical, chemical, physio-chemical and other specialist treatments) there could be some additional need for certain treatment processes. It should also be noted that WY is a net importer of hazardous materials much of which is undergoing treatment within the WY area.

13.3 Future Waste Capacity Requirements for CD&E Waste

- There is excess capacity for the waste transfer and bulking/sorting for CD&E materials facilities within the WY area throughout the duration of the plan and under every scenario combination. These facilities perform an important role in the WY area but further capacity may be required to provide suitable geographical distribution. It is not possible to assess whether there is capacity excess as these facilities perform an interim management of waste and are not the final destination for waste management. The modelling undertaken does not map waste transfer usage.

- There is also an excess capacity availability for the recycling of CD&E waste materials under all scenarios until 2028. Under maximum growth/maximum recycling there is a capacity gap in 2029 of 1,695 tonnes rising to 4,398 tonnes by 2036. The excess capacity baseline/no growth is at 120,204 tonnes annually, by 2020 this has diminished to 99,449 tonnes (minimum growth/median recycling) and down to zero by 2029 (maximum growth/maximum recycling). Recycling of CD&E waste is economically more viable at more localised facilities due to the lower value and costs of transporting lower higher density wastes and therefore the recycling facilities for this waste stream may be required within the WY area (even though shortfalls only appearing later on and under the maximum scenario combination over the plan period).

- Landfill capacity will be required principally for excavation waste for which no alternative option is available. There are currently eleven operational inert landfills within the WY area, however several are scheduled to close over the plan period (the old Sewage works landfill in 2019, Bromley Farm Landfill in 2020, Hollins Hey Landfill in 2023 and Nostrell Quarry Landfill and Laneside Quarry Landfill in 2025). There are a few potential sites that are either inactive, require quarrying before the production of the void space or are at the safeguarding stage only. There is a capacity gap under all scenario combinations across the plan period. At 2017, baseline/no growth the capacity gap is over 240,000 tonnes (243,344 tonnes) at 2020 (minimised growth/median recycling) this is at 209,593 and at 2036 maximum growth/maximum recycling) this has increased vastly to 697,045 (due to site closures). If no further capacity is forthcoming it seems apparent that export out of the sub-region of excavation materials will have to take place at a large scale. It is considered necessary to investigate further the potential for an additional site , extension of an existing

facility or bringing forward capacity within quarrying/restoration operations to help ease capacity shortfalls.

13.4 Future Waste Capacity Requirements for Hazardous Waste

- There are capacity gaps for specialist hazardous wastes undergoing recycling which are currently in part treated outside of the WY area and, due to the specialist nature of the facilities that treat this waste, it is assumed that this practice will continue throughout the Plan period; There is a capacity gap for recycling facilities for hazardous materials over the plan period from baseline/no growth at 2017 of 19,413 tonnes increasing to 20,867 in 2017 for maximum growth/maximum recycling which increases to 35,780 tonnes by 2036
- There is a capacity gap for hazardous waste landfill in the WY area but this does not occur until 2036 assuming no growth and baseline position as this coincides with the closure of Bradley Park Quarry in 2029 and also the limited life of Thornhill Quarry Landfill (some cells can accept hazardous materials) which closes in 2020. This is another landfill site in the plan area that had cell capacity for hazardous waste disposal but this is currently closed (Skelton Grange Landfill, Leeds). Consideration will have to be made as to whether Bradley Park Quarry could be extended in life in the future or if it is acceptable to export hazardous waste for landfill outside of the WY area.

13.5 Future Waste Capacity Requirements for Agricultural Waste

- Off-farm disposal is included within the modelling and there is no shortfall except for very a small quantity for hazardous landfill near the end of the plan period hence there is no requirement for new facilities for agricultural wastes over the Plan period.

13.6 Future Waste Capacity Requirements for Sewage Sludge

- Anticipate adequate provision by the Water Companies with any additional requirement being met within existing operations.
- It is assumed that Asset management plans will continue throughout the Plan period.

13.7 Future Waste Capacity Requirements Low Level Radioactive Waste

It is assumed that existing exports of LLW will continue during the Plan period. The quantity of LLW arising in, and exported from, WY area is small and not considered significant.

13.8 Duty to Co-operate

- Under all scenarios where the continued export of waste is likely to be the management option going forward, it is recommended that WY engage in active engagement with those authorities that are significantly impacted by waste exported from WY and also those authorities outside of the WY sub-region that are reliant on waste management facilities within WY. Tables 27 to Tables 32 show in detail the waste imports and exports by authority. The most significant imports are all within the Yorkshire and Humberside region. An exception being the import from Essex of over 44,000 tonnes in 2015 of CD&E materials. Hazardous wastes are imported from a wider geographical area (for example the top three importers are; Knowsley over 67,000 tonnes, Sheffield over 42,000 and Flintshire over 25,000 tonnes). The most significant top three authorities that WYCA exported to include Stockton-on-Tees (119,683 tonnes) Doncaster (79,802 tonnes) and Sheffield (52,991 tonnes).Summary Tables 54-56 show the capacity gaps across each scenario and growth

modifier. The gap identified assumes that all the waste generated in WY is treated within the geographical boundary of WY and NOT exported to other MPA's. The following assessment is based on facilities with expired or live planning consents, and are considered reflective of the type of facilities that are likely to come forward in WY area (supporting information in Table 52). Representative annual capacities of standardised waste management facilities have been assumed utilising this and information from the Guide to Waste Facilities (DCLG now superseded by Department for Energy and Climate Change) (Table 53) . This table (53) is dealing with sites at 1 hectare or above and does not cover small scale activities that might take place on land under 1 ha.

Table 52 Supporting Information (sites with current planning permission within WY but not developed). Reflective of potential future forthcoming applications

Site ref	Site name	Quantity (TPA)	Size (ha)	Supporting Info
	Belmont Industrial Estate	10,000		15/01072/WAM - change of use of existing building from recycling (B2) to mixed mechanical processing of waste (B2) and heat and energy recovery process (Energy from Waste) (withdrawn)
WM2	Ripley Road, Bowling	160,000	2.35	13/01257/FUL - Gasification
WM3	Aire Valley Road, Worth Village, Keighley	130,000	2.8	13/04217/FUL – Energy from Waste (90,000), Tyre Crumb(10,000), Plastics Recycling (30,000) 15/01381/FUL - Energy from Waste (100,000), Plastics Recycling (30,000) 16/06857/FUL- Energy from Waste (100,000), Plastics Recycling (30,000)
N/A	Waddington Recycling	75,000	0.85	06/09330/FUL - Autoclave
	Skelton Grange	300,000	9 (entire site)	11/03705/FU - Energy from waste
	Skelton Grange			Landfill site - closed
	Haigh Park Road, Sturton	75,000		Treatment facility
	Knotford Nook, Leeds			Composting facility
	Moor Top Quarry Landfill	340,000m^3 void post quarrying		Inert Landfill
	Odda Quarry Landfill			Inert Landfill
	Swillington Quarry	4.8million m^3 void post quarrying		Inert landfill

	Rudd Quarry Landfill	180,000m^3 void		Inert Landfill

Table 53 Assumptions made for sizes of waste management facilities (This table is dealing with sites at 1 hectare or above and does not cover small scale activities that might take place on land under 1 ha)

Facility Type	Quantity (TPA)	Land take (ha)
Materials Recycling/Reprocessing Facilities (LACW & C&I waste) Based on median sized facility	128,000	1
Materials Recycling/Reprocessing Facilities (C&D waste) Based on median sized facility	63,000	1
Non-hazardous non-inert landfill	100,000 to 500,000 (or the equivalent void space)	Cannot estimate
Non-hazardous inert landfill	100,000	Cannot estimate
Hazardous landfill	20,000	Cannot estimate
Composting Based on median sized facility	25,000 to 35,000	1 – 2
Energy Recovery Based on median sized facility	150,000 to 300,000	2 – 3
Residual Mechanical Treatment Based on median sized facility	100,000	1

The assumed representative annual capacities of standardised waste management facilities (to estimate the sizes of waste management facilities a median size operation has been chosen) as set out in Table 53, have been applied to the capacity gap forecast . The purpose of doing this is to provide an indication of the land take that would be required in order to meet future waste management requirements. Tables 54 (summaries) and Tabs 55- 57 set out the anticipated land take required to meet forecast gaps in waste management capacity. When calculating the total number of hectares of the sites to set out in the it is advised that this is greater than the maximum land take required under the capacity gap forecasts. A surplus land take requirement is advised for the following reasons:

- Providing a choice and mix of potential waste management sites across the sub-region is important to support waste hierarchy objectives;
- It ensures flexibility to respond to future circumstances and changing approaches to waste management including technological advancement;
  An appropriate mix of sites will help accommodate different waste streams allowing waste operators flexibility to develop the necessary waste management facilities the sub-regions need.

Table 54: WY Capacity Gap, minimum facility requirements (based upon median sized waste facilities) and land take

Source: 4 Resources Forecasting Model, July 2017

Scenario/ Waste Type	2017	2020	2036	Land Take(ha)
No Growth/ Maximised Recycling	**Minimum Number of facilities**			
Composting (LACWHH Secondary)	1	1	1	2ha
Energy Recovery (C&I, Haz, LACW Secondary)	1	1	1	2-3 ha
Inert Landfill (excavation & LACW Secondary)	1	1	2	
Non Hazardous Landfill (all LACW)		1	1	
Hazardous Landfill			1	
Recycling (Hazardous)	1	1	1	1
Recycling (&I, LACW Secondary)	4	4	5	5ha
Maximised Growth/ Maximised Recycling	**Minimum Number of facilities**			
Composting (LACWHH Secondary)	1	1	1	1-2ha
Energy Recovery (C&I, Haz, LACW Secondary)	1	1	1	2-3ha
Inert Landfill (excavation & LACW Secondary)	1	1	1	
Non-Hazardous Landfill (all LACW)	1	1		
Hazardous Landfill			1	
Recycling (Hazardous)	1	1	1	1
Recycling (&I, LACW Secondary)	5	5	8	4-8ha
Mechanical Biological Treatment		1	1	1

Table 54 Comparison of the capacity gap at year across the 3 scenarios, assuming NO GROWTH, all wastes except Sewage and Low Level Radioactive waste (tonnes)

Waste Management	Year	Scenario 1 Baseline	Scenario 2 Max. Recycling	Scenario 3 Med. Recycling	Min no Facilities	est. Land take (ha)
Composting (LACWHH Secondary	2017	25,649	27,776	27,776	1	1 - 2
	2020	25,649	30,967	30,967	1	1 - 2
	2036	25,649	30,967	30,967	1	1 - 2
Energy recovery (C&I, Haz, LACW Secondary)	2017	97,602	134,043	124,153	1	2-3
	2020	97,602	188,705	163,979	1	2-3
	2030	97,602	188,705	163,979	1	2-3
Inert Landfill (excavation & LACW secondary)	2017	244,139	233,466	240,324	1	
	2020	199,766	173,084	190,227	1	
	2036	557,886	502,631	531,203	2	
Non-Hazardous Landfill (LACWHH/HNN, LACW Secondary)	2017	0	0	0		
	2020	167,640	0	35,028	1	
	2036	167,640	0	0	1	
Hazardous Landfill (Agr, Haz)	2017	0	0	O		
	2020	0	0	0		
	2036	51,393	51,398	51,398	1	
Recycling (Hazardous)	2017	19,413	19,413	19,413	1	1
	2020	19,413	19,413	19,413	1	1
	2036	19,413	19,413	19,413	1	1
Recycling (C&I, LACW Secondary)	2017	450,356	460,997	452,195	4	4
	2020	450,356	476,959	454,953	4	4
	2036	450,356	581,039	565,725	5	5
EXCESS CAPACITY						
Recycling (specialist materials– including metal recycling, End of Life Vehicles and WEEE	2017	403,148	395,138	395,138	Surplus	Surplus
	2020	403,148	366,340	366,340	Surplus	Surplus
	2030	403,148	356,840	356,840	Surplus	Surplus
Composting (LACWHH/NHH)	2017	25,592	22,259	22,259	Surplus	Surplus

Waste Management	Year	Scenario 1 Baseline	Scenario 2 Max. Recycling	Scenario 3 Med. Recycling	Min no Facilities	est. Land take (ha)
	2020	25,592	19,533	19,533	Surplus	Surplus
	2036	25,592	19,533	19,533	Surplus	Surplus
Recycling (CD&E)	2017	120,204	109,543	116,401	Surplus	Surplus
	2020	120,204	93,552	110,696	Surplus	Surplus
	2036	120,204	64,980	93,552	Surplus	Surplus
Treatment Plant (EXCLUDING HAZARDOUS, specialised treatment of biodegradable liquids and wastes, organic waste treatment by distillation, chemical treatment and physio-chemical)	2017	238,857	238,857	238,857	Surplus	Surplus
	2020	238,857	238,857	238,857	Surplus	Surplus
	2036	238,857	238,857	238,857	Surplus	Surplus
Treatment Plant (INCLUDING HAZARDOUS, specialised treatment of biodegradable liquids and wastes, organic waste treatment by distillation, chemical treatment and physio-chemical)	2017	156,208	155,377	156,465	Surplus	Surplus
	2020	156,208	154,131	156,851	Surplus	Surplus
	2036	156,208	141,521	143,993	Surplus	Surplus
Recycling LACWHH/NHH	2017	119,624	103,422	103,422	Surplus	Surplus
	2020	119,624	79,119	79,119	Surplus	Surplus
	2036	119,624	79,119	79,119	Surplus	Surplus
Residual MRF	2017	447,083	457,903	457,903	Surplus	Surplus
	2020	447,083	474,133	474,133	Surplus	Surplus
	2036	447,083	474,133	474,133	Surplus	Surplus
Incineration no energy recovery	2017	4,149	4,149	4,149	Surplus	Surplus
	2020	4,149	4,149	4,149	Surplus	Surplus

Waste Management	Year	Scenario 1 Baseline	Scenario 2 Max. Recycling	Scenario 3 Med. Recycling	Min no Facilities	est. Land take (ha)
	2036	4,149	4,149	4,149	Surplus	Surplus
MBT	2017	816	822	822	Surplus	Surplus
	2020	816	831	831	Surplus	Surplus
	2036	816	831	831	Surplus	Surplus
EfW (LACWHH)	2017	8,149	8,137	8,137	Surplus	Surplus
	2020	8,149	8,119	8,119	Surplus	Surplus
	2036	8,149	8,119	8,119	Surplus	Surplus

Table 55 Comparison of the capacity gap at year across the 3 scenarios, assuming MINIMISED GROWTH, all wastes except Sewage and Low Level Radioactive waste (tonnes)

Waste Management	Year	Scenario 1 Baseline	Scenario 2 Max. Recycling	Scenario 3 Med. Recycling	Min no Facilities	est. Land take (ha)
Composting (LACWHH Secondary	2017	25,806	27,946	27,946	1	1 - 2
	2020	26,019	32,414	32,414	1	1 - 2
	2036	26,970	35,562	35,562	1	1 - 2
Energy recovery (C&I, Haz, LACW Secondary)	2017	99,423	136,097	126,141	1	2-3
	2020	101,901	194,348	169,250	1	2-3
	2030	113,000	209,652	183,199	1	2-3
Inert Landfill (excavation & LACW secondary)	2017	253,167	242,422	249,325	1	N/A
	2020	220,067	192,982	210,384	1	N/A
	2036	652,084	592,970	623,538	1	N/A
Non-Hazardous Landfill (LACWHH/HNN, LACW Secondary)	2017	0	0	0		
	2020	174,621	0	0	1	
	2036	197135	0	0	1	
Hazardous Landfill (Agr, Haz)	2017	0	0	0		
	2020	0	0	O		
	2036	54,948	54,953	54,953	1	
Recycling (Hazardous)	2017	20,139	20,139	20,139	1	1
	2020	21,045	21,045	21,045	1	1
	2036	26,985	26,985	26,985	1	1
Recycling (C&I, LACW Secondary)	2017	462,076	472,787	463,926	4	4
	2020	476,744	503,742	481,405	4	4
	2036	572,128	719,194	695,386	6	6
MBT LACW	2017	0	0	0	0	
	2020	0	0	0	0	
	2036	1,316	1,300	1,300	1	1
EXCESS						
Recycling (specialist materials– including metal	2017	401,281	393,217	393,217	Surplus	Surplus
	2020	382,167	361,841	361,841	Surplus	Surplus

Waste Management	Year	Scenario 1 Baseline	Scenario 2 Max. Recycling	Scenario 3 Med. Recycling	Min no Facilities	est. Land take (ha)
recycling, End of Life Vehicles and WEEE	2030	357,384	357,384	357,384	Surplus	Surplus
Composting (LACWHH/NHH)	2017	23,887	22,259	22,259	Surplus	Surplus
	2020	22,928	17,530	17,530	Surplus	Surplus
	2036	22,259	12,384	12,384	Surplus	Surplus
Recycling (CD&E)	2017	115,277	104,545	111,448	Surplus	Surplus
	2020	109,100	82,047	99,449	Surplus	Surplus
	2036	69,224	10,143	40,711	Surplus	Surplus
Treatment Plant (EXCLUDING HAZARDOUS, specialised treatment of biodegradable liquids and wastes, organic waste treatment by distillation, chemical treatment and physio-chemical)	2017	238,857	238,857	238,857	Surplus	Surplus
	2020	238,857	238,857	238,857	Surplus	Surplus
	2036	238,857	238,857	238,857	Surplus	Surplus
Treatment Plant (INCLUDING HAZARDOUS, specialised treatment of biodegradable liquids and wastes, organic waste treatment by distillation, chemical treatment and physio-chemical)	2017	154,604	153,768	154,863	Surplus	Surplus
	2020	152,601	150,493	153,253	Surplus	Surplus
	2036	139,469	123,756	126,401	Surplus	Surplus
Recycling LACWHH/NHH	2017	118,373	102,072	102,072	Surplus	Surplus
	2020	116,668	75,578	75,578	Surplus	Surplus
	2036	109,077	66,485	66,485	Surplus	Surplus
Residual MRF	2017	444,822	455,708	455,708	Surplus	Surplus
	2020	441,741	469,182	469,182	Surplus	Surplus

Waste Management	Year	Scenario 1 Baseline	Scenario 2 Max. Recycling	Scenario 3 Med. Recycling	Min no Facilities	est. Land take (ha)
	2036	428,023	456,467	456,467	Surplus	Surplus
Incineration no energy recovery	2017	4,110	4,110	4,110	Surplus	Surplus
	2020	4,061	4,061	4,061	Surplus	Surplus
	2036	3,740	3,740	3,740	Surplus	Surplus
MBT	2017	563	569	569	Surplus	Surplus
	2020	218	0	234	Surplus	Surplus
	2036	0	0	0	Surplus	Surplus
EfW (LACWHH)	2017	7,392	7,380	7,380	Surplus	Surplus
	2020	6,361	6,330	6,330	Surplus	Surplus
	2036	1,769	1,737	1,737	Surplus	Surplus

Table 56 Comparison of the capacity gap at year across the 3 scenarios, assuming MAXIMISED GROWTH, all wastes except Sewage and Low Level Radioactive waste (tonnes)

Waste Management	Year	Scenario 1 Baseline	Scenario 2 Max. Recycling	Scenario 3 Med. Recycling	Min no Facilities	est. Land take (ha)
Composting (LACWHH Secondary	2017	25,963	28,116	28,116	1	1 - 2
	2020	26,394	31,866	31,866	1	1 - 2
	2036	28,351	34,229	34,229	1	1 - 2
Energy recovery (C&I, Haz, LACW Secondary)	2017	101,249	138,158	128,135	1	2-3
	2020	106,249	200,056	174,581	1	2-3
	2030	134,020	236,882	208,423	1	2 -3
Inert Landfill (excavation & LACW secondary)	2017	262,221	251,405	258,354	1	
	2020	240,607	213,116	230,779	1	
	2036	761,503	697,907	730,793	1	
Non-Hazardous Landfill (LACWHH/HNN, LACW Secondary)	2017	0	0	0	1	
	2020	181,685	0	45,176	1	
	2036	230,271	0	0	1	
Hazardous Landfill (Agr, Haz)	2017	0	0	0	1	
	2020	0	0	0	1	
	2036	59,073	59,079	59,079	1	
Recycling (Hazardous)	2017	20,867	20,867	20,867	1	1
	2020	22,696	22,696	22,696	1	1
	2036	35,780	35,780	35,780	1	1
Recycling (C&I, LACW Secondary)	2017	473,833	484,613	475,692	54	4
	2020	503,444	530,842	508,170	5	5
	2036	713,316	920,240	861,741	8	8
MBT LACW	2017	0	0	0	0	
	2020	386	370	370	1	1
	2036	3,543	3,526	3,526	1	1
EXCESS CAPACITY MAXIMUM GROWTH						
Recycling (specialist materials– including metal	2017	399,409	391,291	391,291	Surplus	Surplus
	2020	377,920	357,287	357,287	Surplus	Surplus

Waste Management	Year	Scenario 1 Baseline	Scenario 2 Max. Recycling	Scenario 3 Med. Recycling	Min no Facilities	est. Land take (ha)
recycling, End of Life Vehicles and WEEE	2036	334,755	311,707	311,707	Surplus	Surplus
Composting (LACWHH/NHH)	2017	23,181	22,259	22,259	Surplus	Surplus
	2020	22,259	15,503	15,503	Surplus	Surplus
	2036	22,259	4,913	4,913	Surplus	Surplus
Recycling (CD&E)	2017	110,336	99,532	99,532	Surplus	Surplus
	2020	97,8865	70,406	70,406	Surplus	Surplus
	2036	10,219	0	0	Surplus	Surplus
Treatment Plant (EXCLUDING HAZARDOUS, specialised treatment of biodegradable liquids and wastes, organic waste treatment by distillation, chemical treatment and physio-chemical)	2017	238,857	238,857	238,857	Surplus	Surplus
	2020	238,857	238,857	238,857	Surplus	Surplus
	2036	238,857	238,857	238,857	Surplus	Surplus
Treatment Plant (INCLUDING HAZARDOUS, specialised treatment of biodegradable liquids and wastes, organic waste treatment by distillation, chemical treatment and physio-chemical)	2017	152,995	152,153	153,256	Surplus	Surplus
	2020	148,952	146,812	149,614	Surplus	Surplus
	2036	120,024	103,120	105,965	Surplus	Surplus
Recycling LACWHH/NHH	2017	117,118	100,718	100,718	Surplus	Surplus
	2020	113,678	71,997	71,997	Surplus	Surplus
	2036	98,056	53,284	53,284	Surplus	Surplus
Residual MRF	2017	442,555	453,507	453,507	Surplus	Surplus
	2020	436,338	464,174	464,174	Surplus	Surplus

Waste Management	Year	Scenario 1 Baseline	Scenario 2 Max. Recycling	Scenario 3 Med. Recycling	Min no Facilities	est. Land take (ha)
	2036	408,105	438,005	438,005	Surplus	Surplus
Incineration no energy recovery	2017	4,071	4,071	4,071	Surplus	Surplus
	2020	3,972	3,972	3,972	Surplus	Surplus
	2036	3,266	3,266	3,266	Surplus	Surplus
MBT	2017	309	315	315	Surplus	Surplus
	2020	0	0	0	Surplus	Surplus
	2036	0	0	0	Surplus	Surplus
EfW (LACWHH)	2017	6,633	6,621	6,621	Surplus	Surplus
	2020	4,552	4,521	4,521	Surplus	Surplus
	2036	0	0	0	Surplus	Surplus